142762

59

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA, Plaintiff,	)	
vs.	)	No. 78 C 1004
OUTBOARD MARINE CORPORATION and MONSANTO COMPANY, Defendants.	)	

The deposition of JOHN NORDIN, called by the Defendant Outboard Marine Corporation for examination, pursuant to notice and agreement and pursuant to the Rules of Civil Procedure for the United States District Courts pertaining to the taking of depositions, taken before Thea L. Urban, a Notary Public in and for the County of Cook, State of Illinois, and a Certified Shorthand Reporter of said State, at the United States Attorney's Office, 219 South Dearborn Street, Room 1486, Chicago, Illinois 60604, on the 10th day of June, A.D. 1982, commencing at 10:00 o'clock a.m.

PRESENT:

MR. SEBASTIAN T. PATTI,
(Enforcement Division
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604),

appeared on behalf of the United States of America;

16-5V28.0/076

Thea L. Urban
Certified Shorthand Reporter
[illegible] South La Salle Street
Chicago, Illinois 60603
312-782-[illegible]

PRESENT: (Cont'd.)

MS. ROSEANN OLIVER,
(Phelan, Pope & John, Ltd.
30 North LaSalle Street
Chicago, Illinois 60602),

and

MR. JEFFREY C. FORT,
(Martin, Craig, Chester & Sonnenschein
115 South LaSalle Street
Chicago, Illinois 60603),

appeared on behalf of Outboard Marine Corporation;

MR. JAMES H. SCHINK,
(Kirkland & Ellis
200 East Randolph Drive
Chicago, Illinois 60601),

appeared on behalf of Monsanto Company.

- - -

JOHN NORDIN,

called as a witness herein, having been first asked to affirm, was examined and testified as follows:

THE WITNESS: The testimony I will give will be true insofar as I know it.

DIRECT EXAMINATION

BY MS. OLIVER:

Q Dr. Nordin, are you employed by Mason & Hanger?

A That is correct. The correct title of the firm is Mason & Hanger - Silas Mason Company, Incorporated.

Q You are employed at the Lexington Engineering office?

A Correct.

Q You have been employed since September of 1978, is that correct?

A Yes. Now I'm going to clarify that further.

I worked for Mason & Hanger - Silas Mason Company with a joint venture with Rust Engineering Corporation from 1965 through 1971 where we were under government contract with the Office of Saline Water to test various types of water treatment devices, such as electrodialysis, filtration, carbon adsorption, et cetera. I was employed under that contract, Mason & Hanger/Rust

Engineering Company from 1965 through 1971.

I then left that company, Mason & Hanger, when the contract was finished and worked for Betz Environmental Engineers, later become known as Betz, Converse, Murdoch, and I stayed with them until 1978 with Betz, Converse, Murdoch. This is where I learned or acquired the bulk of experience with water and waste-water treatment.

Q Since 1978, since you rejoined Mason & Hanger, in what areas have you worked?

A My title is Staff Consultant. I will give you my card. I am sorry, Staff Engineer; I take that back. Sometimes they are called Staff Consultant.

I work on environmental problems, primarily, and also on other problems of a chemical engineering nature.

Q You worked on a project done by Mason & Hanger involving Waukegan Harbor on Outboard Marine property, is that right?

A Yes.

Q That project involved PCBs?

A Up at Waukegan?

Q Yes.

A Yes.

Q Since 1978, what other projects have you worked on involving PCBs?

A Since 1978, none directly; indirectly, we were asked by EERU, Emergency Environmental Response Unit, to look at Eadstop Corporation, where we would go into a hazardous waste dump site which would include anything containing PCBs, but we were looking at this in general as to how we would handle this, how would we protect the people who would be sampling this, how would you sample this and how would you put the material. It might be material in the bottom of a lake, might be material in drums, might be a dump site. How would you prepare this material in such a way that you could feed it into an incinerator for destruction of the organic materials.

And also, we'd have an afterburner or secondary combustion unit on this incinerator and then a gas cleanup to remove hydrochloric and other gases that might be removed, et cetera.

Q When were you involved in this project for EERU?

A I'm going to have to look at that. It would either be in late '79 or early during 1980, and I am going to state -- I would have to go back and look at the record that was late in '79, but I am not positive

of that.

This was kind of a multiple type project. I remember I was working on this in November and I think that was '79, but I will have to check that to make sure.

Q Before 1978, did you do any work with PCB sediments?

A Not as such, no, not identified as such.

Now, work with sediments that may be contaminated with PCBs, I don't know. We did not specifically test, but we had a number of contracts with Betz, Converse, Murdoch.

I don't want to get into all the little details here.

Q Let me ask you a question:

During the time you were with Betz from 1971 through 1978, did you work on any projects involving PCBs?

A Not where PCBs were specifically addressed.

Q Not where you knew there were PCBs?

A Not positively, absolutely where I knew there were PCBs in there.

Some of these things, they were contaminated with who knows what materials.

Q But you worked on no projects where you made recommendations or did any testing or sampling for PCBs?

A Not prior to '78.

Q As a staff consultant for Mason & Hanger --

A I guess I am staff engineer, if you look at my card.

Q Staff engineer.

Does that mean you are assigned to different projects and provide chemical engineering help?

A Yes.

Q What work did you do in this Waukegan project?

A I wrote the rough draft of the study; not all of it, but probably about 60 percent, 65 percent. I cannot say the exact percentage of the study report.

Q That is dated January 1981?

A January 1981. I wrote the Addendum, the Second Addendum, did the volatilization study.

Now, when I say I wrote 60 to 65 percent, that does not mean I generated all the information. In some cases I am asking as a stenographer.

Actually this report is an input of a large number of people at Mason & Hanger and what we would do is sit down around the table like we are doing

now and consider all aspects that we could think of and what if, what is the best way of doing things.

Q It is also --

A Now --

Q Wait a minute. The report from January 1981 also contains materials from other sources outside of Mason & Hanger, is that correct?

A Um-hmm.

Q Is that yes?

A Yes.

Q It is a cumulation of information provided by other sources?

A Right, and I believe in the report we in some of our sections, we give a short summary of what that report was and is as well as representation of most of the raw data; possibly all of the raw data, I am not sure, and the report was based on at least what we felt was pertinent.

Q Did you have specific areas, and I am not talking about writing now. I am talking about areas of the project.

A Yes.

Q What were those areas?

A Primarily on the water treatment aspect and

also on the interpretation of how to handle -- handle is not the best word, but how to interpret some of the sampling that was done by others and specifically that there was a muck layer, a sand layer and a clay layer and how the sampling related to the collecting samples in these particular layers.

Now, prior to that the studies that we looked at, frequently we would look at, would sample at such and such a depth, but I'm not sure what exactly they mean by that depth, whether it was sampled in the muck or the sand or the clay; just exactly where that sample came from.

One of the first things I did was go out and about and witness some of the sampling, how it was sampled and exactly what was sampled and where it was collected from. This helped a great deal in interpretation of results.

Q How many times did you visit the site?

A Let's see, I will have to --

MR. PATTI: If you recall.

BY THE WITNESS:

A I am going to have to say approximately three or four or five times, somewhere in that range.

BY MS. OLIVER:

Q That was for the purpose of looking at the areas being sampled or that had been sampled?

A I remember, I recall looking at the North Ditch site at least twice and the Waukegan Harbor site, probably three times, maybe more.

I would have to go back and look at my notes and look at the dates and then I could construct, reconstruct that information if it is important.

Q The purpose of your visit was to check the sampling locations?

A The purpose of the initial visit was to get a layout of what was going on.

I want to correct one thing I happened to think of. One other time I visited the site, so it is actually more than three times I visited the Waukegan site. I'd say it was about five times, because I happen to remember visiting the site again.

I visited the site early, probably in early June of 1980. That would be my first contact or somewhere about that time, and just to see, kind of see what was going on.

Let's see. I was there early in July and when some samples were being collected by Warzyn for the purpose of running some treatability samples.

Q Were you down when samples were run by Warzyn?

A I was trying to think if I still made the trip out to the site. Dr. Sterling made a trip out to the site. I'm not sure if I was there at that time or during August, ran treatability studies on the samples that were taken. They are written up in the appendix of the report --

Q Wait a minute.

A During September --

Q Wait a minute.

During August when you were doing your treatability tests, you did not do it on the site?

A No, we didn't. We did it in the EPA lab on Clark Street.

During early September, I was up at the site when the EPA was with ERG collecting, I believe, data points, seven data points if I am not mistaken. I think the number seven rings a bell in my mind and I witnessed the sampling technique and then took independent measurements of exactly where they were sampling, what was being sampled, what was the depth of the sample to the top, muck layer; how to measure the muck layer and during that time, comparing different measurements and I developed a procedure that I felt I would be com-

fortable with and was quite accurate for measuring the thickness of muck.

Q Up to that time in September of 1980, was there a sampling method for determining the muck layer?

A I am not aware of any method. There may have been a method that existed, but I needed to go up there myself and witness it myself and watch it myself before I could place any confidence in anybody else's measurement, because one of the problems that I had in reviewing the data was that this muck layer was quite soft.

You could take a pipe and stand it on one end and it would go right past through the muck and then come to rest on the bottom of the sand unless you are in an area where the muck is 10 feet thick and then it might come to rest a little bit shorter, but generally it would come to rest on the top of the sand.

We looked at some of these methods that people were using for sampling and we weren't sure, looking at their data, whether they were actually sampling in the muck or whether they were bypassing the muck and sampling into the sand.

Some of the data, looking at the PCB concentration and then the percent solids in the grain size of some of the sampling suggested that sand was

being sampled and some of the muck was being bypassed.

So in early September, I wanted to go aboard the boat and witness the sampling, see exactly what the situation was. I suspected in my own mind what the situation was, that there was a muck layer and a sand layer and a clay layer, but I needed to go aboard the boat and get some measurements myself.

Having done that, I asked EPA if they would go around about and take additional measurements, which we did, and then later in November, we sent our people -- I watched them for awhile, went on the boat and took an extensive collection of muck depth measurements; the depth of the water at the top of the muck and then the depth of the water to the top of the sand. And this information is the first information that is in our report, should be in the appendix which is what we base our estimate of cubic yardage to be removed of contaminated muck that I found these measurements that were taken.

This is very important because quantity of muck that we removed will influence the cost of the project. We wanted to know if there were going to be 200,000 cubic yards or 50,000 cubic yards. It makes a difference.

MR. PATTI: She hasn't asked you a question.

THE WITNESS: You were asking me when I visited the site.

BY MS. OLIVER:

Q Oh, you have another visit in mind?

A There was another time I was up at the site. I'm not sure if that was at the same time we did the muck measurement in November or a different time. I recall we were on OMC property late in the Fall and I cannot remember the date, but I will go to the calendar. I was up at the North Ditch site with some other people up there.

Q Is there any other visit that you remember?

A I am trying to think.

I don't recall of any other visits. It may well be and I will have to check my calendar for that year to see.

Now, we have visits in the EPA offices. To answer the question, two visits to the North Ditch that I can definitely name on hand and there are several visits to Waukegan Harbor, which I will say at least two visits.

Harry Sterling has visited the site, too.

Q Did you work with Mr. Sterling on a large

portion of the project?

A Yes.

Q He worked on the same areas that you worked on?

A There was some overlap in areas and we spent a lot of time discussing among ourselves and others in Mason & Hanger, avenues of approach.

There were areas he worked on that I paid very little attention to and there were areas that I worked on primarily, on the water treatment, that he was not actively involved in.

Harry Sterling was on the boat with Warzyn when they collected the samples back early in July, about July 1st or 2nd and 3rd. Those are the dates when they sampled those six samples and these are samples that we used for our treatability studies.

Q Samples were taken for the project by Warzyn and ERG, is that right?

A No, samples were taken for the project that we authorized by Warzyn. There were other samples taken by ERG that we did not, necessarily. EPA supplied the results to us.

I was aboard the boat in September as I mentioned earlier when ERG took samples.

Q Did you develop any quality control for the sampling that was done?

A When are you talking about?

Q Sampling in the Harbor or the Ditch or the parking lot?

A Harry Sterling and I together wrote specifications in our contract to Warzyn of how we wanted the samples to be taken.

Q To your knowledge, were those specifications proved by Warzyn?

A To my knowledge, they were and they were followed.

Q How about ERG?

A ERG, I cannot say. I did not tell them how to take samples. We were supplied with the results.

Q You don't know how they took the samples?

A I understand they were taken with chain of custody records, but I didn't have any input in how to tell them to take their samples.

We were supplied with the results of the samples, and like I said, I was aboard the boat when I took -- I am going to say seven samples. I could be wrong on that number, but I believe the number was seven, when they took their seven samples. I believe

there was a duplicate in there, so it may have actually been eight with the duplicate, but I am not sure of that.

Q Did you set up any quality control measures for analyzing samples of PCBs?

A For Warzyn and Raltech?

Q And ERG.

A Not ERG.

Q ERG was --

A Not me.

Q Was that done through the EPA?

A Yes.

Q How about Raltech?

A We wrote general things in our contract to Warzyn and Raltech of how we wanted the samples to be taken.

Now, Raltech developed their own quality control procedures. Some of the details --

Q Did you have any input into that?

A Only what was in the contract as specified and billed out in the contract with Warzyn. I didn't bring that contract with me.

That may sound like I'm evading the issue, but if you have a copy of our contract that we let to

Warzyn, you will see our input to quality control because it is specified in writing.

Q Have you done any PCB analysis?

A Not personally.

Q Have you worked in a laboratory where they were being done?

A Not directly. Betz, Converse, Murdoch has a laboratory and I would visit them and I would tell them how I would like the samples to be done.

I don't recall ever asking anyone to do a PCB analysis, but they are certified and they could do PCB analysis.

Q But have you ever had any experience in analyzing for PCBs?

A Not directly hand-on experience, no, or where I physically give the sample and analyze it myself or write up a procedure for someone to do to analyze it.

Q Are you familiar with the procedure so that you could determine whether the analyses that are done are reliable and accurate?

A I am familiar enough with them. I don't know all the little details. I have no reason to doubt any of the analysis that they may have or Raltech has done.

Q How did you satisfy yourself that the analyses

that you were given by ERG or Raltech were accurate?

A First of all, there are procedures that are written up on how to do PCB analyses that are acceptable to the Government and this is what is followed.

Secondly, the samples were spiked with known amounts of PCB and you might say samples could be sediments, could be spiked known amounts of PCB and then at a later time, run a percent recovery and see if it is 100 percent or whatever it happens to be.

Thirdly, --

Q Wait a minute. Do you know on spiked samples, what the recovery should be?

A I don't know what it should be, but I do have the results of what they actually got. I don't think I am qualified to say what it should be, whether it should be 95 percent or what.

I don't recall what the numbers were that we actually got, but it was very close to 100 percent recovery generally. There may be an exception now and then.

Q Do you know that spiked samples were done?

A Yes.

Q By both ERG and Raltech?

A They were done for Raltech on any work that

we contracted or subcontracted to do as far as Mason & Hanger. I don't have the results on ERG since I can't really judge what they did. I have no reason to doubt what they did.

MR. PATTI: The question was whether you know if any spikes were run at ERG.

THE WITNESS: I am not positive to that.

BY MS. OLIVER:

Q Do you have any reason to know that the results you got from ERG were accurate?

A As far as I know, they were. Now --

Q Were you ever advised that any results that were given to you on PCB data were not accurate?

A Were not accurate? There are two areas where I was advised possibly -- and my recollection is vague, that probably, possibly a chain of custody was violated or samples that may have been lost or discounted. I think the number was seven on that, and I suspect that this is the reason for going up and ERG taking additional samples in September and this helped me find, because I was going aboard the boat to look, but I didn't pursue the reasons why and the details of what happened.

In addition, when I was aboard the boat and took the seven samples and obtained the results, I

disagreed with the location, to what ERG said the location was and what I said the location was on at least two of the samples that since got straightened out and I believe, I think what is reported in the report is an accurate representation of the location.

Q That is in the Addendum?

A Second Addendum, yes.

Q Are those the only two instances that you recall ever having been advised or having knowledge of any --

A Those are the only two instances I know about. If somebody had advised me on some other question about the sample, it went in one ear and out the other and I forgot about it.

Q To your knowledge --

A I have no reason to find fault with the ERG data. If there is any fault at all they can find with the ERG data, I stated in the report and that is this: That the amount of sample that was collected, they did not always get 100 percent recovery of the core. They got something less than 100 percent and I indicate that in the report.

Q What does that mean? Why is that a criticism?

A I don't call it a criticism, necessarily.

I call it an observation of their techniques.

Q Why do you make that observation? What significance is the fact that you do not recover 100 percent?

A Well, something that we felt was important because we did not want somebody to take this data that ERG took and then say they took a core segment and that core segment that they collected in the lab was, say, 5 feet long and can conclude from that that the bottom end of it was 5 feet below the top of the muck sediment. It might have been 7 feet below the top of the muck sediment and we wanted to point that out.

Q What does that mean, did that mean something in terms of muck depth --

A Yes.

Q -- was it that it was not an accurate representation of what the muck depth was?

A We believe it was accurate representation of the quantity of PCBs, but when they took a sample and said it was 5 feet, the sample was 5 feet, it did not necessarily mean that the muck depth at that location was 5 feet.

We believe when ERG took a sample, looking at their sampling techniques, that the sample probe penetrated the muck and then came to rest at the bottom

of the sand and that is when I was aboard the boat. This is the technique they found and you can even see the clay plug or sand plug indicating that it indeed rested and I would go out there with my measure and then measure that and my measure of measuring the muck depth and sand depth and had an independent check, I would do so, and would measure different types just to make sure I understood how they collected the samples and what was being sampled.

Q Did your independent measurements agree with ERG's?

A Well, I took the measurements.

Q You did not let them do it?

A No.

Q I see. That was for seven?

A That was for --

Q Seven sites?

A Seven sites and then in addition, we asked EPA -- I don't know if ERG was along at that time or not. They would go around the Harbor and the Slip and take some additional muck depth measurements and go along with their sampling device, not collecting samples for analysis, but just dropping it. That is what they were going to do, just go around and make sure of themselves

and this information is in the Appendix and then later we plotted up an additional -- we came up with a preliminary estimate of the quantities of muck that was there and then later, September -- not September, I mean November, we asked our own people to go out and take an extensive set of measurements for the depth of the muck.

That is there in the report, those extensive measurements.

Q What --

A This was important to us because we had to know fairly accurately the quantity or cubic yardage of material to be removed. We couldn't say, it makes a big difference if it is 500,000 cubic yards or 50,000 cubic yards as to cost, so we wanted to narrow that down so we felt this information was quite important to us.

Q In terms of cost to the project, what other information did you feel was very important?

A We had to know where the contamination was. When the samples came back from the North Ditch, it was known to us or we discovered that the contamination was not just confined to the surface but the PCB contamination near what we believe to be the outfall and what we call the Crescent Ditch had penetrated the sand and

apparently had pooled on top of the clay, a depth somewhere close to 30 feet. And we reasoned that if the same thing happened in the North Ditch, then this also ought to have happened in the Harbor, so we said, let's take some deep borings in the outfall in Slip 3.

We did that and we indeed found contamination and we said, let's go take some more borings and try to find the extent of contamination.

You see, in addition to contamination being in the muck layer near the outfall, there was some contamination in the sand that would influence the cost, plus there is more additional material to be removed other than the muck.

Q Okay.

A This is very important to know. Just by removing the muck, we are not removing all the PCBs or close to all the PCBs.

We also have this deep pocket contamination and it is important for us to know the extent of this deep pocket contamination, so we know how much is going to have to be removed.

Q What else was important for you to know?

MR. PATTI: In terms of cost?

MS. OLIVER: In terms of cost to the project.

BY THE WITNESS:

A Well, we know how much to be removed, where to remove, where to put this material was important to us and how to handle this material so as to minimize exposure to the public and to satisfy our interpretation of the various regulations on handling of PCBs.

BY MS. OLIVER:

Q What did you --

A We did talk to the Illinois EPA, for example, and we reviewed the TOSCA regulations. We saw at least at that time there was a cutoff point for 50 parts per million of where it should be disposed of in a hazardous waste landfill, so we were looking at the 50 parts per million.

Environmental Protection Agency did give us some input and tell us if we retrieved or handled this water and we would discharge it back to the Harbor to do any treatment or handling and to go back to the Harbor, the water should be one part per billion or less of PCB.

This influenced the cost. If we bring this aboard a location where we can treat it and we look for the purpose of the report, the vacant OMC property as a site from which we can treat. We looked

at lagoons and things and dewatering and looked at separate alternatives, but the location of the ultimate disposal site, how you handle it, what you do, all these things, there are a whole bunch of different scenarios one can work up.

For the sake of being brief, we were only covering very limited number of scenarios in our study report, but there are a lot of sub-scenarios that one could work on these alternatives and these influence the cost. It is a very complex project.

Q Have you ever worked on one as complex as this?

A Oh, I would say that is a hard question to answer. I don't think I worked one as complex as this, of this type, but there are some projects that technically may involve some rather complex things.

For one thing, this is a one compound that we are primarily working with PCBs. I suppose you can say suspended solids and things like that and you have a whole different slew of things to worry about and there are some projects that involve a lot of complex unit operations.

Q Did you consider whether there were any other materials to be concerned about?

MR. PATTI: I am not clear about the question.

Do you understand the question?

MS. OLIVER: The Doctor said this was a PCB project and other things like suspended solids.

BY THE WITNESS:

A Oh, yes, suspended solids, yes. That is important because suspended solids can adsorb PCBs and you must remove suspended solids as well.

I was interpreting your question to mean heavy metals and other organics and things. Maybe that is what your question was, I don't know.

BY MS. OLIVER:

Q Did you consider any materials like that?

A We looked at this based on the preliminary studies, but we did not actively consider it. But I believe in the final design specs, we did not cost this into the study but in the final design specs, we called for a lot of other things to be monitored and looked at.

The other thing in our treatability studies, we wanted to be convinced the system would work and if there are organic materials in the Waukegan Harbor, water soluble organic, any of these interfere with the process.

We knew from experience from dealing with

settling of suspended solid material and things like that and also from working with carbon that we felt that the system would work, but we wanted to set this up in the laboratory and convince ourselves that it would work.

Now, if we ran into a situation that it didn't work, let us say I ran those tests and found out it didn't work and, by the way, I received results of the test after the results were done. Let us say I didn't get one part per billion PCBs and I would start suspecting there were other materials. Maybe I would want to know if I didn't get one part per billion, maybe some other organic materials, some water soluble materials in Waukegan Harbor are confusing the situation, confusing my results.

At that time, I would probably want to try to launch another study to define this, to find out what those materials are.

Q When you did your treatability studies in the lab --

A Correct.

Q -- why was it necessary to do a treatability study?

A I wanted to be convinced that what we had

recommended would work, at least in the lab. We worked fairly good size samples, 5-gallon size samples.

Q Had it been tried before in a similar situation --

A Well, we had --

MR. PATTI: Let her finish the question, please.

BY MS. OLIVER:

Q (Continuing.) Had this treatability --

A Oh, I'm sorry, I am sorry.

Q Had this treatability system to reach one part per billion been tried commercially before?

A Yes, Calgon, but we wanted to be convinced that it would work here.

As I said, there could be interfering organic materials or some interferences that we didn't know about and was yet undiscovered and before we made a recommendation, we wanted to be convinced ourselves -- I am a skeptic -- that it would work.

Q What is Calgon experienced in?

A Calgon is experienced in use of activated carbon or removing of trace organics from water, including PCBs.

Q When you say trace organics, what do you mean?

A Water soluble organic materials.

Q Does it make any difference of what concentrations they are?

A It does as far as economics are concerned, but carbon will remove highly concentrated organic materials as well as dilute, providing they are water soluble. It does not remove all organic materials. Some low molecular weight things, it does not remove very well, but things such as PCBs it does.

Q Does Calgon use this method on its wastewater?

MR. PATTI: If you know.

THE WITNESS: Excuse me?

BY MS. OLIVER:

Q Does Calgon use this method on its wastewater?

A I'm not sure if I follow you. Calgon uses the method --

Q You told me that Calgon was experienced in this method.

A Yes.

Q My question is how is Calgon using this method?

A Calgon has used activated carbon to remove water soluble PCBs and they told me they need a 7-minute retention time to do this, 7-minute contact time with

the water containing PCBs and they would get one part per billion coming out and they even supplied us with some adsorption isotherms where PCBs adsorbed on carbon.

We used a 12-minute retention time and I believe in our design, we used 15-minute retention time.

Q Why was it increased over the seven --

A To make sure.

Q To make sure what, that it is out?

A To make sure that we would remove the PCBs.

Whenever we design something, an engineer designs something, he usually puts in a safety factor beyond a minimum.

We discussed this with Calgon beforehand and they agreed with our approach and in fact recommend that approach. There are a lot of things that could happen in the field and we do want a little bit of a safety factor.

Q The laboratory tests you ran are done under controlled circumstances, is that right?

A As near as we could control them.

Q When you put this treatment system out into the field, you are not going to have control of all factors that you had in the laboratory, are you?

A We have written up in our document a set of controls for these, the final treatment system. And it should be a matter of public record, not a matter of public record, but you should have a copy of that.

Q If you don't meet the one part per billion effluent level that the EPA set, what is the effect of that on the treatment system?

A If we don't, we are measuring for one part per billion. We are measuring the trend, in other words, measuring the quantity at periods of time. I've forgotten that increment. I think we called for composite once a day to look at the approach and see it approaching one part per billion. If it looks like it might be exceeded, we would shut down and see what the problem is.

Q What happens to everything in the lagoon and the water that you are treating when it shuts down?

A Say we stop the dredging, it is contained.

Q That could possibly happen, can it not?

A There is always a possibility of anything happening. I don't foresee anything that could cause it to happen, but I suppose some storm or something could come up and cause some problems that could be there. There are a lot of factors involved here.

Q How long will this treatment system be working, over what period of time?

A In our study report, we used eight months. We can actually do this in much less time because we put in some factors for delay. I have forgotten the time factor that was used in the design. It may or may not be eight months. I think it is longer than that, but these are safety factors that were put in.

Q So the treatment system would be running approximately eight months?

A It would be rented for eight months. It may not be running for eight months.

Q How many hours a day would it be working?

A Once we get going, it would be running continuously.

Q 24 hours a day?

A Yes. Well, some of the filters may be backwashed on it, but there would be other portions, that is, it would be running at 1,500 gallons per minute. We would prefer not to interrupt that 1,500 gallon per minute level once we started.

Now, in the study report, we have a slightly different scenario that we do interrupt it a little bit when we backwash the filters.

Q Doctor, what is the practical operation of this treatment system? Is it going to run continuously for 24 hours a day for eight months, or are there going to be interruptions, or does anybody know?

A I cannot exclude the possibility that there would be some interruptions. It is a complex thing.

If there is an interruption in the system and the system is shut down, you stop your dredging, let the lagoon sit and you ascertain as to what the problem is and then you bring it on line.

Somebody may decide they want to run the system internally, taking the effluent water and then pumping it back to the lagoon to make sure the one part per billion number is achieved and then somebody will have to decide -- whoever the on-scene coordinator will be, and will have to decide it is okay to put it on line.

I think it is an individual circumstance. They cannot categorically say they are not going to have any problems. We recognize that it is a very complex project.

Q The water treatment system --

A I am talking about the project overall, including everything.

Q Does the operation of this treatment system depend on, to a great extent, the filters that are used?

A Yes, we consider the filters as part of the treatment system.

Q If those filters are clogged up or stopped up --

A You backwash them.

Q But it is going to interrupt the system, will it not?

A In our final design we have spare filters and we may try to maintain the 1,500 gallon per minute flow if one filter is out of line for backwash.

Q If you have high levels of suspended solids, will that interfere with your filters?

A You mean high levels of suspended solids going to the filters?

Q Correct.

A You will have a shorter filter time, filter run.

Q Your filter time of five to ten minutes time will be increased?

A No, the 15 minutes applies to the carbon filter. There are two filters here. There are carbon and sand filters.

The sand filter removes the turbidity

ahead of the carbon filter. The turbidity is already removed and then it goes on to the carbon filter.

Q How long a retention time do you need for the sand filter?

A I have forgotten the number that was used. It depends on the type of sand filter that is used. I am going to say roughly 3 gallons per minute per square foot, but I don't remember excactly the number. That was in the design. It was about that number.

Q What effect does the high level of suspended solids have on the filter?

A High level of suspended solids have on the filter -- it means you have a shorter filter run time and you will have to backwash more frequently, but you still should get just as good clarity of water providing you did not make the mistake with the Palmer addition or do something strange.

You do need to have polymer ahead of the filters to help settle the solids. Otherwise you will get suspended solids in the back filter.

Q Who is contemplated to operate this system?

A Who?

Q Yes, do you know?

A As far as a name of an organization, I don't

know.

Q I take it the people who run the system are going to have to know what they are doing, right?

A Probably will have a certified operator of some type in accordance with Illinois regulations.

MR. PATTI: You are just speculating?

THE WITNESS: I believe our final design report specifies exactly what is to be done.

If you have any questions, I would prefer you look at that.

BY MS. OLIVER:

Q Did you have any responsibility, Dr. Nordin, for where the sediment should be disposed of?

A I have had input. I don't know if I would call it responsibility. We subcontracted with Warzyn to look at alternative disposal sites.

Warzyn came up with the recommendation with that alternative disposal site. We reviewed with at Mason & Hanger, everybody who had knowledge about that project and we concurred with the recommendation.

Q Your recommendation was on-site disposal area?

A This was our first choice, but we also recognize that there could be some problems involved.

Alternative disposal sites may also be feasible.

It is somewhat like choosing the lesser of several alternative evils if I am permitted to use the words. I wish I could wave some magic wand and they can all go away.

I think I said something we can all agree on.

MS. OLIVER: I think you did.

BY MS. OLIVER:

Q When you prepared your March 1982 Addendum, the Second Addendum, you concluded that additional sampling should be done, did you not?

A Um-hmm.

Q Yes?

A Yes, but do recognize that additional sampling also costs money and there are constraints on money. Somebody is going to have to weigh that judgment, too.

Q But it is your opinion today that --

A I would like to see some additional sampling.

Q -- your opinion that additional sampling should be done?

A Yes, I would like to see some additional sampling. I think the extent of PCB contamination near the outfall needs to be better defined exactly where that boundary

was.

I would like to see if there is any change in PCB concentration in the muck sediments.

I would like to see a little better handle up on sampling up in Slip 3, come up with a better estimate on the total pounds of PCB that are now in Waukegan Harbor.

I also recognize that these additional samples are going to cost money, so somebody is going to have to weigh those two things.

Q But as a scientist, you would like some additional work?

A I would like to see more --

Q -- additional work being done before you decide specifically what action should be taken?

A I am deciding right now on the basis of what I have, what appears to be the best approach. I think the additional sampling would be to further define the situation.

I think there is enough sampling done right now to come up with a general concept of what should be done.

Q When you talk about a general concept, you are not talking about the job that is ready to be bid and go

out there and be done, are you?

A Well, the job that is ready to be bid and to be done, we recommend that the contractor go and re-measure the muck depth to see if they were the same.

We also, I believe, and I may be mistaken, I would like to see some additional sampling. I don't know if that is specified in a document or not, I have to check it, but I would like to see some additional sampling being taken near the outfall near Slip 3, especially near the bulkhead to see if PCBs have slipped behind the bulkhead and further define that to see if the boundary that had been stated for that deep excavation is correct or should it be extended any further.

I think personally I would like to see some better definition of what is in there.

Q When you are talking about personally, you are talking about scientifically?

A Yes. I think that this would be Mason & Hanger's opinion, too. There are some other things you can --

MR. PATTI: I don't think we have a question pending.

BY MS. OLIVER:

Q Do you have any other areas you would like to

see additional work done?

A There were some other areas I would like to see Waukegan Harbor sampled, but I don't think they are important, that pertinent for the costs that we developed.

Q Will you tell me what other areas?

A I would like to see more sampling in the muck sediments to come up with a better estimate of pounds of PCBs and we discussed that in the Second Addendum.

I would also like to see some sampling to see if there is a change in the amount of PCBs in muck in the Harbor.

Q Am I correct that one of the problems you saw with all the data that was generated was that it was somewhat inconsistent because it was done by different groups over different areas at different times?

A Yes. I think instead of the word inconsistent, I would use the word apparent inconsistency. It was a matter of how to interpret that data, what is the best way of interpreting exactly what is being measured.

We had some doubts in our own mind and we wanted to confirm this, exactly what was being measured.

Q Would you say the data over time and by all

the different people who did analyze out there presented a confusing picture of what was out there?

A It does not now, but when we were first given the data, it appeared quite confusing.

Q Did you use all the data that was available?

A I hesitate to say yes and somebody will find some data that we didn't use, so I am going to say at the outset, there are a couple of pieces of information that did not get into the report and as far as I know, these are the only pieces of information -- I am talking about raw data, not commentary observations or somebody's conclusions.

Of the data that was furnished to us, there may be some data not furnished, would be a few borings in the site away from OMC property that did not show PCBs and we did not go into a great deal of detail in our report and it didn't affect the cost any. I can show you where those points are.

Q Would you refer to the map in your report and show me where?

A The reason it was not included is because the scale of the map did not allow room.

Q Which map are you looking at, the Appendix?

A Yes. What I am saying is there were a few

data points that were taken outside the boundary of the map over here and over here (indicating).

That did not show PCBs and I don't believe they were mentioned or documented in the report.

Q The report or the map that you are looking at is Subsurface Investigation of the North Ditch Area?

A Yes. There were some sampling that was done outside the North Ditch area.

Q Is this sampling on the land?

A Yes.

Q It was done to the south and to the west?

A It was done near the area where the lagoon was going, we proposed to put the lagoon. There were several borings there and they did show PCBs and I believe there was one boring on the other side of the railroad tracks that was taken, maybe more than one, and I would have to refer to the Warzyn report to find out exactly where it was.

It did not show PCBs and we did not make a big issue because it did not impact our study. Had it shown PCBs, we would have discussed it further.

Q Is there any other data that you are aware of that you were provided that you did not use in your report?

A Not that I am aware of. Some of the data we summarized and we did not go in a lot of detail on the report, but we looked at it.

Q Does all the data that you used and relied upon appear in Appendix 1?

A It appeared in the Appendix, yes.

MR. SCHINK: Mr. Patti, have these other boring results been supplied to us?

MR. PATTI: I don't know the answer to the question.

MR. SCHINK: Could you check?

MR. PATTI: I believe you testified they were outside the OMC boundary area, is that right, Dr. Nordin?

THE WITNESS: The area shown on the map and the reason we did not put it was not because we were trying to hide something, but we did not, we were not able to fit it in the scale of the map.

MR. SCHINK: Some of these borings were on OMC property, is that correct?

THE WITNESS: That is correct, and they did not show PCBs.

MR. PATTI: We will determine that.

BY MS. OLIVER:

Q Dr. Nordin, Appendix 1 is a summary or listing of all the PCB data that was used?

A You also have an addendum, not an addendum, but an Appendix dated January 26 with some data that did not get into the Appendix 1 or 2. I think you have a copy of that.

Q January 26, 1981 refers to data obtained in 1976 sampling done by Soil Testing, Inc. and analysis performed by Dearborn Chemical?

A The problem as we mention in the -- in particular, in the Appendix and you go to, like in the Appendix, it is not there, but it was put in later. Now, if somebody finds some data that is not in the report, that is not done intentionally other than as I have just stated.

Q If there is data that is not in the report, you would want to see that data, wouldn't you?

A Yes, I would want to see that data, yes.

Q It might influence your recommendations or your conclusions on the Harbor and the North Ditch and the parking lot, mightn't it?

A Possible.

MR. PATTI: Is there a question pending now?

(Nordin-OMC Deposition Exhibits Nos. 1 and 2 marked for identification, 6/10/82, TLU.)

BY MS. OLIVER:

Q Dr. Nordin, I would like you to look at what we have marked as Nordin Exhibit Nos. 1 and 2 which are reports from a Mr. Nottingham in the U.S. EPA laboratory dated August 2 and 3, 1976 regarding some analyses of samples from Waukegan Harbor.

Have you ever seen those reports before?

MR. PATTI: If you remember.

BY THE WITNESS:

A My answer to that question is I haven't seen these reports.

Now, the second part is have I seen the results of these samples, I don't know without having to go back and look at what I have. I don't think so. I don't recall having seen them, but I would have to go back and look at the report and look at the raw data.

BY MS. OLIVER:

Q How did you obtain these data from the Harbor and the North Ditch that had been done?

A How did I obtain it?

Q Yes, for purposes of your review and in your report.

A On the top of the page, each one of the pages, says the source of the data. Now, this is all data that

was furnished to us by the EPA.

Q So the EPA gave you what you considered to be all the existing data?

A The EPA gave us data. Now, whether it was all of the existing data, I don't know.

Q Did you ask for all of the existing data?

A I'm going to have to say I don't know to that question.

Q You don't know if you asked?

A You are trying to ask me something about a year and a half from now, all the discussions that might have taken place about a year and a half from now, all the discussions that might have taken place about a year and a half ago.

Q Isn't one of the first things that you would want to do in gearing up this project is to have all the data available?

A That is as much as we can, yes. We probably asked for all the data, but we recognize there may be data that they may not have supplied for us for one reason or another or there may have been other data that they didn't recall.

Q You don't recall ever asking whether you had all the data?

A I do not, right now. I probably did at the time.

I don't have a tape recorder with me and record every sentence that might have taken place.

Q You don't have a letter with you that shows you asked for all the data, do you?

A I don't have a letter that asks for all the data.

Q But in any event, you considered it important to have whatever data was available, is that correct?

A That is correct.

I am looking at the samples. They don't even show on this result that I can see where the samples were taken and the location. I see samples that vary from a few tenths of a part per million to 220,000 parts per million at the other end.

Q Yes, they are very interesting, aren't they?

A Yes. The more data that you have from different sources, I think the more comfortable a person is.

Q Dr. Nordin, we marked as Mr. Russell Cook's Deposition Exhibit No. 6, the proposal for the engineering study related to Waukegan Harbor.

A Yes.

Q The second part of the proposal is a review of existing data. It states that, "Mason & Hanger will review in detail the work completed by others prior to this study."

Was that your understanding of what your job was?

A Yes. If it is not given to us and we are not told about it, we don't have any real control over it. When we receive data, we receive it in good faith that we receive all of the data. If somebody had some data, if some data is not given to us, probably it is a slip-up, or maybe the people at EPA were not aware of it, the people who gave us the data or there may be some other reasons.

Q You don't know why --

A I don't know why.

Q -- you don't know why you didn't get the exhibit --

A I don't know.

MR. PATTI: Wait a minute. There has been no testimony he did not receive that data.

MS. OLIVER: He testified he doesn't recall --

THE WITNESS: I testified I don't recall --

MR. PATTI: He testified he didn't recall seeing

this particular report. The report --

BY THE WITNESS:

A I am not saying that I haven't seen the data that this report was based. We may have seen that.

BY MS. OLIVER:

Q Does it appear in your Appendix No. 1?

A I would have to check that. I cannot tell by looking at the numbers. I would have to go back and review it. It doesn't ring a bell.

Q There is no such listing of a source in your Appendix 1 as it appears on Exhibits 1 and 2, is there?

A It is not listed in Appendix 1 and probably I have not seen it. That at least is the conclusion I would have to reach at this time.

I can't go back a year and a half ago. One problem I have looking at this data is I don't know where the locations were, where the samples were taken from.

Q If you got this information, you would go back to Region V laboratory and ask for more information, wouldn't you?

A If we had the analysis, if we had the sample and we had the location where it was taken from, it would have been included in our estimates for PCB

poundage. This is the only place where I could see that data would affect the result as our estimates and calculations for PCB poundage, which incidentally is not dependent upon the recommendation that we had unless we have deep contamination in these pockets of PCB that we are not aware of. That is possible, too.

Q Exhibit 1 shows a carbon copy to H. Zar. Do you know who he is?

A Yes.

Q Who is he?

A Yes, Howard Zar.

Q He is with Region V EPA here, is that right?

A Yes.

Q Is he a person you had discussions with during the course of your --

A I have talked to Howard Zar. Harry Sterling is actually the coordinator for the project.

Q How many times have you had conversations with Mr. Zar?

A Quite a few times.

Q 30, 50, 100?

A It wouldn't be 100 times. It would be probably more than ten times. I don't know the reasons behind that data.

Q All right.

A And in looking at it, I cannot tell where the samples were taken from and even if I did know, unless it shows pockets of PCB contamination, I cannot see how it would influence my report except in the estimate of poundage of PCBs, but our estimate of poundage of PCBs does not really influence our decision -- I mean whether it was, say, 200,000 pounds or 400,000 pounds. It doesn't really influence our decision as to the recommendation.

Q Wouldn't the sample results from the Harbor and the North Ditch be results you would want to see?

A Yes.

MR. PATTI: I think he has already answered that question.

BY THE WITNESS:

A (Continuing.) I am going to make an assumption.

MR. PATTI: You don't have to assume anything.

THE WITNESS: Okay.

BY MS. OLIVER:

Q Were you aware of any problems during the course of sampling and analyses for PCBs done by any of the consulting laboratories or firms relating to problems with homogenizing the samples?

A I am not aware of any problems that were insolvable.

Q What problems were you aware of?

A There were some delays. We didn't get some of the results as fast as we would like them because we were under a deadline to submit the study report, so we didn't get the results on some of the samples as fast as we would like.

But recognized that there were certain quality control worked out between EPA and between Raltech and between us, and that had to be done, so we just had to wait patiently until these things were satisfied.

Q My question went specifically to problems with homogeneity of samples.

A I am not aware of any specific problems. I am aware that some of the problems, someone taking homogeneous samples, it is very difficult to get a mix or separate and come up with an accurate result. I think this is a concern, I think it could be argued that maybe there would be one or two analyses that could be biased high or low if it wasn't completely homogeneous, but you also had to consider there were many, many samples taken.

Some were high and some were low and if there was a problem in homogeneity --

Q In your opinion if there were 50 or 60 or 70 samples that were high or low because of those problems, would you want to know about it and find out what the problem was?

A Yes, that's why we do a quality control and that's why there are spiked samples run and duplicate samples run, to ascertain that. If we started to do spiked samples and found we were getting less than 100 percent recovery, somebody was getting 300 percent recovery of PCBs or records of much higher PCBs was being analyzed than was being put in, something was awry and we better go back to the drawing board. And that's why we have those procedures.

Q That is why you are interested in what the controls are showing, is that right, from the different consulting firms?

A Um-hmm.

Q Yes? You have to answer.

A Yes. That's why we're interested.

Now we have more direct control than when we subcontracted to Warzyn. We have less control on some of these other studies. I have to accept in good faith

that what they did was correct.

Q For example, EKG, you had to accept what they did?

A Yes, I had to accept what they did.

There is a story that I have heard that possibly seven samples may have not had chain of custody, so there was a problem with those samples. I don't know the details now, what they ran into, but I remember back then, but I don't remember what the problem was.

Q Someone told you the story about seven samples lost or did you see some documentation?

A I didn't see any documentation.

Q Somebody told you there were seven?

A Somebody told me there was a problem with some of the samples.

Q You do not recall that the problem was with 67, do you?

A No.

Q That would be a bigger problem, wouldn't it?

A Yes. What was the problem with 67 samples?

Q What?

A What was the problem with 67 samples?

Q We have heard they lost 67 samples.

A When I speak of seven samples, I am talking a

about seven core samples. They may have been segmented into subdivisions.

Q Dr. Nordin, are you aware of any problems with taking duplicate samples or replicate samples?

A They were duplicate samples being done for analyses of PCBs.

Q Do you know what replicate samples are?

A You mean samples at the same location?

Q Yes.

A There were some that were taken in the same location and they didn't always show the same results.

Q What does that mean?

A It means to me that if you look at the data, the distribution of PCBs in the muck and other locations is highly askewed. There are pockets of high concentration adjacent to low concentration.

When you take a sample at the same location, you want to get it right at the bore location. You have already moved that location, so you take it right next to it.

Q Does that affect an estimate of how much PCBs are there?

A It can affect the estimate of quantity of pounds of PCBs.

Q Did it affect the estimate in this case?

A What do you mean?

Q Were you able to estimate with any degree of scientific certainty, Dr. Nordin, how much PCBs are present?

MR. PATTI: You are talking about independent of any of these alleged problems with duplicate and replicate samples, is that right?

MS. OLIVER: For the whole project.

MR. PATTI: You are just asking him the general question?

MS. OLIVER: Yes.

BY THE WITNESS:

A I discussed the problems in the report. I tabulated the data that was used and I discussed the method that we used and how they had come up with an estimate of pounds of PCBs and I discussed the problems of the askewness of data. And this is documented in my report, what the answer is.

BY MS. OLIVER:

Q You said in the report that the amount of PCBs could vary by order of magnitude, did you not?

A I use that term very loosely, unfortunately. I do use it loosely.

Q Order of magnitude means 10, doesn't it, 10 times?

A In some context, but in the context the report is used, it is used loosely, so you will have to look at the specific instance at where it was used.

Q I am talking about the amount of PCBs.

A And quantity of PCBs in terms of pounds, depending on how the data is treated and handled, it is possible that it may be higher or lower by a factor of 10. I doubt it would be that much, but by a factor of 10.

Q You cannot tell me what factor it would be though, can you?

A I cannot tell you exactly what factor because it makes a difference how you analyze and treat the samples and where the samples are collected and things.

Q So what you are saying is --

A Pounds of PCBs are very difficult to estimate.

Q What you are saying is somebody could take the data and group it together and do some calculations and --

A Come out with different results.

MR. PATTI: Let her finish the question, please, before you answer.

BY MS. OLIVER:

Q -- and come out with an estimate of PCBs that is entirely different from what you would come out with or could come out with?

A I am not sure what you mean by total. It could be different.

Q And it could be significantly different, up to 10 times as much?

A I am not sure. I don't think it could be 10 times, but I can see if someone were to use a very different sampling method, it could be several times different, possibly as high as 10. But I think it would be very hard to get a bias, not the word bias, but a method that would be 10 times different. I can see some problems using geometric means versus arithmetic where you might come up with a different answer. I discuss this in my report.

Q You cannot tell me that the amount of PCBs that you estimated to be present is accurate, an accurate amount, can you?

A It can vary.

Q The Final Report of January 1981 refers in discussing the estimate of the amount of PCBs, it refers to arithmetic versus geometric methods to analyze.

A Yes.

Q What is the difference between those two?

A Arithmetic average is best illustrated by an example and that is that I sum up the quantities and divide by the number of samples.

For example, if I have one part per million and I average that with another sample that is two parts per million and I have two samples, one plus two equals three, and I divide by two, and that is 1.5.

Now, the geometric, the way I believe Thomann did that initially and we had some discussions on this, I talked to him by phone and I believe in December of 1980.

Dr. Thomann has suggested using a geometric mean because he noted that some of the samples were very high in concentrations of PCBs and he wanted to temper the results so the higher number didn't askew the data. So what is done is to take the geometric mean, which is like logarithmic average. You can interpret it to mean two samples. One times two and then take the square root or if you have eleven samples, you multiply one to each number by itself and take the eleventh root and come up with a geometric mean of some sort.

You would ignore those samples that had less than one part per million because if you put that

into a factor, you come out with zero. We used arithmetic averages. We said it really didn't make too much sense to us --

Q What didn't?

A Geometric, the way I understood he used it.

Q Why not?

A Because if you take samples and you put them on the table, let us say if you hada sample, a cup. Say that cup is filled with PCBs. That cup over there is 5 parts per million PCBs and you had another 200 part per million PCBs in another cup filled with maybe a thousand part per million PCBs. You want to take those cups and put them in a large mixing bowl and stir them up all together and then you want to say what would be the concentration of that mixing quantity would be.

The arithmetic average is what gives you the result and that's why we chose the arithmetic. We recognize a geometric mean would give you a lower estimate on quantities of PCBs than arithmetic, but we were doing this using arithmetic, not because we wanted to show a higher concentration or higher amount of PCBs. We did it because we felt it would be more correct to use arithmetic and this would give you a true mixed value of what it would be.

Q Was it your understanding that Dr. Thomann used a geometric means to estimate?

A At least as of December he was and he may have changed his mind.

Q Do you know whether his estimates were higher or lower than yours?

MR. PATTI: If you know.

BY THE WITNESS:

A I'm not sure. I don't know what his final estimate is. At the time his estimates, I believe, were lower. I am not sure of that. Geometrically averaging would result in lower, would result in a lower mean, but he put a big range on his estimate. At least the number we had as of December and let me see what he said. It's in the report.

MR. PATTI: No, you don't have to.

BY THE WITNESS:

A (Continuing.) It had a very wide range of estimate of PCBs and ours was within his range, our final estimate.

BY MS. OLIVER:

Q Did you have any other discussions with Dr. Thomann other than the one you told me about in December of 1980?

A Summer of 1980?

Q December of 1980.

A Oh, December.

I would have to look at my phone log to see.

Q You don't recall discussing any other matters with Dr. Thomann?

A I don't recall at this time. I may have had other discussions.

Q Do you know if you talked Dr. Thomann into changing his method of calculating?

MR. PATTI: I'm going to object to that question. You can answer it, if you can.

BY THE WITNESS:

A I don't know what method ultimately Dr. Thomann used and anything that took place after December of 1980.

I did talk to Dr. Thomann as to why we used an arithmetic average and that was the reason why I just told you, that is, if you mixed things of varying quantity, put them in a large bowl and mixed them up, the arithmetic average is what would give you the results.

BY MS. OLIVER:

Q Does that assume that you can mix all these things in a large bowl and they will mix?

A I am talking about in theory now. I am trying to state a mathematical principle to make it clear. You are talking about --

Q The real situation.

A The real situation and we are talking apples and oranges now. I am trying to illustrate a concept of what arithmetic means.

Q Would it be fair to say then that the estimate you made of PCBs in Waukegan Harbor and North Ditch area does not reflect the real situation out there?

A No, I did not say that. I am saying we looked at the data that were available and applied methods of calculations. We stated what those methods of calculation are in the report and came up with estimates of PCBs.

Q You don't know if that estimate accurately reflects what is out there, do you?

A It is what we believe the best estimate to be. If somebody else wants to quibble or look at it, look at the raw data and analyze it differently, they may come up with a different estimate.

We discuss the problems in this report. There are problems with knowing exactly where the boundary of PCB contamination is.

Q By not knowing exactly where the boundary of

PCB contamination is, it also makes an uncertainty in an estimate of how much material is going to be removed, doesn't it?

A You cannot say exactly how much material is going to be removed. This is a fault of having -- the more samples you can get or collect, the better able you are to define the amount of materials to be removed and the quantity and refine that number.

Q So the estimates that you gave of the amount to be removed could vary?

A It could be different.

Q Could vary?

A Could be different.

Q Could be more than what you estimate?

A Could be more than what I have estimated and it could be less. And I would be happy if it were less.

Q That is why as a scientist, you would recommend more sampling be done?

A I would like to see more samples be done. In fact, I would like to see some bacteria come in or some magic and they all go away.

MR. PATTI: Are you at a convenient spot to take a break?

MS. OLIVER: Sure.

(Brief recess had.)

(Nordin-OMC Deposition Exhibits Nos. 3 through 3V, inclusive, marked for identification, 6/10/82, TLU.)

BY MS. OLIVER:

Q Dr. Nordin, did you have any responsibility for any decisions concerning dredging recommendations?

A Responsibility?

MR. PATTI: Do you understand the question?

THE WITNESS: Yes. I am just trying to think of the best way to answer that question because responsibility is a vague term and I am going to have to --

MS. OLIVER: Let me withdraw the question.

THE WITNESS: I think that --

MR. PATTI: She is going to rephrase it.

BY MS. OLIVER:

Q Let me withdraw that question and ask you if you have any experience in dredging harbors?

A No.

Q Have you ever been responsible for designing any dredging operations?

A No. I think to answer your first question --

MR. PATTI: She withdrew the question.

MS. OLIVER: I withdrew the question.

THE WITNESS: Okay.

BY MS. OLIVER:

Q Your area of work is chemical engineering, is that right?

A Yes, and experience very often in environmental aspects.

Q Dr. Nordin, did the EPA make the decision that the water treatment system that was proposed was not required until the dredging of the Harbor began?

A I am not sure I understand your question. Could you rephrase it?

Q Sure. Let me start again.

Is it your understanding that the water treatment system is not required until the dredging of the Harbor begins?

A We are talking about the Harbor and not North Ditch now?

Q The Harbor.

A So regardless of what is going on in North Ditch, the answer to your question is yes, but I am going to qualify that by saying there should be some tests mechanically to see that the thing works, there aren't any leaks in the system before you actually put

it on line on the dredged materials.

Q Is it your understanding that the recommendation by Mason & Hanger is that the excavating work should be done before the Harbor is dredged?

A Are you talking about excavation, decontamination of Slip 3, or are you talking about the excavation at the North Ditch?

Q Either one.

A The dredging in Slip 3 should be done before excavating the decontamination. You don't stir or rile up the muck. That part should be done.

If someone decides they want to excavate and to work up at North Ditch, that is a separate project and that could be done separately providing you have a place to put the excavated materials, to stockpile the materials.

Q But in your opinion and to the best of your knowledge, Mason & Hanger recommended that the Harbor be dredged before the area around the outfall be excavated?

A Yes, although it is possible you could do this scenario. You could dredge Slip 3 and then put in decontaminant and go in and excavate in the part of Slip 3 before you dredge the rest of the Harbor. That

is also possible.

Q What is the recommendation?

A Okay. The recommendation is to do the dredging first before going into the decontamination. I don't remember the exact time frame, if you want to dredge the lower part toward the mouth of the Harbor, whether you want to do your decontamination before you do that part or what, but it is necessary that you dredge the muck sediments in Slip 3 before you excavate Slip 3.

Q You would use the water treatment system for the materials that are dredged out of the Harbor and the materials that are excavated from the area near the outfalls?

A I would like you to restate that question.

Q Do you not understand it?

A I think I understand what you are saying, but I want to make sure I am answering the question that you want me to answer. I wonder if you could restate it.

Q I am not sure if I can make it any clearer. Let me just ask it again and you can try and answer it.

My question is, Dr. Nordin, whether it is your recommendation that the water treatment system would be in use and utilized for the materials in water

taken from the dredging procedure in the Harbor and the excavated materials from what you call deep pockets around the outfall in Slip No. 3.

A I think you said the same thing that you did before and I am going to have to answer with what I think you said.

Q That is the best we can do.

A I am presupposing that you are taking this material and putting it into the lagoon and that is the part that I was looking for.

Q Right.

A Now, these materials settle in the lagoon and you have some excess water. Any water returned to the Harbor has to be sent through this water treatment plant if you want to obtain the criteria of one part per billion of PCBs.

Q So the water from the operations in the Harbor would be treated by this water system?

A Yes. Now, I recognize that when you do your dredging, it is possible there may be some flushing out or may be something that may escape, but beyond that anything that is pulled out with sediments will be transferred over to the lagoon. The materials would settle. Anything that is excavated would be transferred

to the lagoon. Any water inside that pocket of deep contamination or Cofferdam that describes that would be transferred to the lagoon.

Any water that is in that lagoon would be treated through the water treatment system before return to the Harbor if you want to meet that one part per billion of PCBs requirement that we have.

Q Is it your understanding that after the dredging and excavation work is done there are going to be PCBs in the Harbor?

A Pardon?

Q There are going to be PCBs in the Harbor?

A Yes, there will be PCBs that will not be taken out. We will not remove all of it even with the most stringent alternative that we specified.

Q When you were obtaining data on the samples that were done, taken from the Harbor and North Ditch, did Mason & Hanger request priority analyses?

A Yes. I am assuming your definition of priority is the same as mine.

Q Did you request the priority?

A Yes, we requested that Raltech analyze some samples ahead of other samples.

Q How did you determine priority?

A We were under a deadline to complete our study by such and such a date. I think it was in December or something. Raltech was also, had not completed the analysis of samples. We needed those analysis results to define where the area of contamination was.

Especially our first priority, since we were looking at the slurry wall and the Cofferdam approach near the Crescent Ditch in the Oval Lagoon was to obtain the results of those deep borings that was obtained around the Crescent Ditch and the Oval Lagoon. Those got first priority. We wanted those results and we didn't have those results. We put a priority on that.

Later when there were samples in the parking lot, we were estimating on PCBs to be excavated and this took a later priority, so we needed the results of those samples in order to do the things, recommend a solution.

There were some we sampled because of their location. We felt these were more critical as far as us coming up with an engineering estimate.

We were coming up with our final report and we still didn't get the results of all of our samples and that is why we had an Addendum. Had we waited with no priority at all, just analyze whatever

they wanted to analyze, then some of our engineering study might have to be delayed because we wouldn't know what boundary to put on a Crescent Ditch or Oval Lagoon or how deep to go.

Q You told me earlier that you prepared a rough draft of the final report, is that right?

A Yes. I did not bring it with me.

Q Was there only one rough draft that was prepared by you?

A There was only one rough draft that was prepared by us that was submitted to EPA. We may have had earlier versions that we had internally and doctored up in-house. I say doctored up in-house, I mean a review of all the Mason & Hanger employees that had something to say about that.

Q When was the draft sent to the United States EPA?

A About mid-December.

Q And your final report then was completed when?

A Final Report was dated in January. I think it was sent somewhere around the 18th or the 25th, somewhere around there. I do not remember the exact date.

Q How long did it take you to get results back

from Raltech?

A We were receiving results back all the way along when we were writing the report and into the Final Report when we were still receiving it and after we received the Final Report, we were still receiving results back.

Q Do you know how long it took Raltech to analyze samples from the time they got it?

A I have a record of that, but I can't recall exactly now, what it is.

Q 30 days?

A No, it was more than that for all of the samples.

Q They didn't get all the samples at one time, did they?

A They did not analyze all the samples. There was a limit as to how fast they could analyze all the samples.

Q I would like to show you Exhibit 3 which is a Group Exhibit of several Mason & Hanger letters to Raltech regarding sampling. The first one, Exhibit 3 and 3A is a letter of November 17, 1980, "Enclosed is our new order of priority listing. Most of these samples should have some PCB contamination."

Did you prepare these samples listed?

A Harry Sterling and myself prepared the listing. They didn't always follow this order, though.

Q How did you determine that most of the samples should have PCB contamination?

A We were not really sure whether they did or not. We looked at the locations where those samples were on our map and looked to see if they were near samples that had already shown PCB contamination and if they did, then we stated that they should. We didn't say all of them should. We were interested in getting the results back as soon as possible.

Now, if Raltech, let us say for example, we had reason to believe that a sample had no PCB contamination at all or Raltech thought, then somebody does an analysis and finds PCB contamination that is way different, he is going to have to run that sample over again to do it. I have no reason to doubt any of Raltech's results.

Q So you provided Raltech with what you expected they would find?

A Raltech already knew there would be PCB contamination. That was not new information.

Q But you are advising them that most of the samples should have PCB contamination?

A That is nothing new.

Q But before the analyses were done, you were advising them there should be PCB contamination in some of the samples?

A Yes, they knew that. They wouldn't be analyzing if they did.

Q They wouldn't be analyzing if they weren't supposed to find some PCBs?

A In some of the samples, there would be some that were free. We couldn't guess which ones. We could only guess by locations.

Q The second document, the part of Exhibit 3 is a letter dated August 21, 1980 and it consists of 3-B to 3-F.

Did you prepare this list of priority samples?

A It would either be Harry Sterling or myself collaborated and, again, we did this because we needed results in our report, for the report with the PCB location.

Q I show you what has been marked 3-G which is a letter dated August 29, 1980 to Raltech from Mason & Hanger - Silas Mason Co., Inc. requesting completion of Percent Volatile Solids --

A Yes.

Q -- on the following sediment samples.

Did you prepare the list that appears in this letter?

A You mean the results?

Q The sample and the description that appears in the letter.

A Yes, I wrote this out.

Q Why did you request percent volatile solids?

A We were curious.

Q About what?

A The reason is the higher percent volatile solids indicate an organic content of sediment for the sample. Let us say we had -- the higher the organic content, the more readily it is able to adsorb PCBs.

Q What does that mean in terms of what you were studying?

A If I brought back a sample that had a very high volatile solids indicating a high organic content, I would know that sample would quite readily adsorb PCBs and I would know at the same time probably would not release those PCBs very readily.

I wanted to know how much organic matter was in the sediment that was not PCBs. This is a very

rough and quick and dirty estimate to get that piece of information.

Q So what --

A If it had a high volatile solid content, I would know there was a lot of organic material. It might be biologic material, might not have anything to do with PCBs, but I know PCBs would be readily adsorbed on such a sediment.

Q What did you find?

A I would have to go back and hunt that information up.

Q Did you find in the North Ditch sediments that the PCBs adsorbed onto materials?

A Let's see. It's been a while since I looked at it.

That is summarized someplace and I am trying to figure out where.

Q You are referring to Table 1 on the Appendix?

A We asked for percent.

Q Let me identify Appendix 3 to the Final Report, Table 1?

A Yes. There are the results right there. We wanted to know what type of material we were working with. I think it is important to know, not just PCBs

were present, but physically what type of material we are working with.

We don't have enough money to analyze for all the heavy metals and different chemicals, but these were the things that they could easily do.

Q For the first six --

A That's some organic materials in there.

Q -- samples, do the results show that PCBs were adsorbed onto the materials?

A These materials do have PCBs in them. It shows that they are.

I can't say whether they adsorbed onto the organic which would be representative of volatile solids or adsorbed onto the inert which would be your sand or clay or silt that is there.

Q Did you do any study to find out if PCBs adsorbed onto the materials as you said earlier; therefore, wouldn't release?

A That is a question that can't really be answered yes or no. I wonder if you could rephrase that.

There are other studies that indicate whether they would be released or retained, adsorbed, but they are qualitative. They are not designed to specifically answer the question that you state.

Q Am I correct that the reason you requested the percent volatile solids was to determine what other organic materials would be present on which the PCBs in those samples would be adsorbed and therefore, not be released? Is that what you wanted to do when you requested those samples to be analyzed?

A Let's back up a little bit.

We wanted to design some water treatment tests to ensure that we could remove the water down to one part per billion of PCBs. Now, this is influenced by a number of different things.

We also had to worry about volatilization and resolubilization. We didn't have enough money to do a full-blown project, but we did say we could get an idea on how to do it if we were asked to sample for other parameters such as volatile solids. We had for oil and grease and we asked for CODs and asked for certain other things.

Now, if it had a high volatile solids content in there, it would be indicative of fairly high organic content and PCBs would be readily adsorbed onto those organics and it would tend to adsorb onto those organics and it would be very hard to remove or hard to be released.

They would be almost fixed unless some bug or something got in there and chewed up those organics and then maybe they would be released under those circumstances.

We wanted to know what type of material we were working with.

Q Did you do any testing or any study --

A To see how much?

Q -- to see whether the PCBs were in this sediment, were as you said fixed in those sediments?

A Not specifically designed for that. We do have tests where we slurry PCBs with water and look at soluble PCB content in that water and you can infer from that that that would be released.

Q If you wanted to do a test to determine whether PCBs were adsorbed or fixed in the sediment and wouldn't be released, you would do that study or test?

A If I wanted to see if they were fixed, I would take those sediments and slurry with water, let the sediment settle, and be sure you have all the sediments that you need to be run through a sand filter and then analyze the water for PCB content, soluble PCBs -- and by the way, we do that and it shows where PCBs, if the PCBs were fixed and never were removed, it would

forever remain low in that water column -- strike that. I should say it would not forever, but it would during the test time of the test be low, not saying forever because some bug might go in there and chew up the organism and it may be released at some later time.

Q Well, the PCBs in water in the Waukegan Harbor are very low, aren't they?

A Yes.

Q That doesn't show they're being released in the water?

A It doesn't necessarily follow because you have a number of things taking place. You have volatilization taking place, too. The rate of PCB being released in the water, if the rate of volatilization from the Harbor is much greater than the rate to which the PCBs were volatilized in the water, that PCB concentration in the water column will be low, so you have to have a sink for those PCBs, someplace for them to go.

And if they volatilize, go up into the air, then that concentration in the Harbor would be low, but that does not show that it is going to be released.

Q Why then did you request the percent volatile solids -- let us go back to that -- if that doesn't show

you about --

A It is additional information. Let us say I got volatile solids, instead of 3 percent, let us say I got volatile solids of, say, 50 percent or 80 percent.

I would want to do some more tests to find out what those organics, and this would influence my decision, probably, but if they are around 3 or 4 percent, then I would know yes, there are some organic materials in here, but the bulk of the material is mostly still clay and this confirms what Warzyn has said. It is an independent check to give me additional information.

Q Do you know why some samples were not --

A It is clay and that's clay. Normally I would not expect clay to have high volatile solids content. It is a matter of having so much money available.

Q Why did you only ask for eight samples to be analyzed for percent of volatile solids?

A Part of our Warzyn contract. I could have asked for ten, could have asked for 20, could have asked for two.

Q You only asked for eight?

A Yes, for volatile solids.

Q Do you know whether anyone has expressed an

opinion about whether PCBs volatilize from the Harbor?

A You have read my volatilization study?

Q Yes.

A When you say expressed an opinion, the information is right in that volatilization study.

Q That is the only literature you are aware of?

A Well, there is the literature that came out since what I wrote and there are probably other sources that I was not able to or didn't discover in the time allotment of the study, but these are what I believe to be the most important sources of people.

Q Could you have done a study count of volatilization?

A I would have liked to have done some measurements, but we had so many moneys available. I would have liked to do some actual measurements of volatilization, but we are limited on funds on what we can spend and we asked for funding to do some measurements of volatilization, get a better handle on this project. We have a lot of things taking place: Volatilization, solubilization, et cetera, et cetera. We wanted to take some additional measurements. Money is not available. Money is available only to do a literature search and that is what we did. We did a literature search

as best we could and we tried to come up with estimates of what we thought the volatilization rate would be from the Harbor for the different kinds of operations.

Q Doesn't your study concern volatilization during the course of the project proposed?

A We were concerned with it.

Q Did you make any determination or estimate of what volatilization if any there is presently?

A In the back of our volatilization study we made some estimates of what we thought the volatilization rate would be, based on the assumptions that are stated in the report, yes. We don't know if that is what you would actually get. We do recommend measurements.

Q You don't know whether you'd get your volatilization estimates during the project work, is that right?

A We don't know that that would be what you get. It is a very complex thing. We do like to have measurements taken when the project is under way.

Now, there is also the funding problem, too, and we are limited to dollars to which we can spend. So one is going to have to make a judgment of how important that is when funds are --

Q You say volatilization is an important

consideration, don't you?

A I think it is something that we have to be concerned with, yes.

Q Could you give me an estimate of how much it would have cost to have done the measurements that you wanted to do on the volatilization?

A For volatilization?

Q Yes.

MR. PATTI: What kind of estimate are you asking for?

MS. OLIVER: Money, how much would it cost.

MR. PATTI: Can you answer off the top of your head?

BY THE WITNESS:

A The more money that is expended, the better the results you would get and I would estimate to do it properly, we are talking in the neighborhood of $100,000 plus, possibly even greater.

Right now I think the best thing to do is to monitor it as you do the operation.

BY MS. OLIVER:

Q You would not change any of your opinions expressed in your volatilization study today, would you?

A Not at this time. There have been some studies

on volatilization, I understand, that have come out since I wrote this report, especially on the measurements.

Q But as far as you are concerned, your report is still reliable?

A At this time, yes. If somebody comes up with additional facts, I would say I am not open to change.

Q Exhibit 3-H through V is an October 17, 1980 letter from Mason & Hanger to Raltech, again listing samples and indicating expected PCB results, is that right?

A Yes. I will tell you why that was written that way. The reason is we were in a hurry to get the sample results. Raltech has to make an estimate or Raltech, when we do an analysis, has to make an estimate of what percent cut it would be.

If they guess wrong and they come up and it is a different concentration that they estimate, they have to come back and redo it and it takes time.

Q Let me see if I understand it.

It is your understanding that before Raltech does an analysis, they make a determination --

A They don't make a determination.

MR. PATTI: Wait until she finishes.

BY MS. OLIVER:

Q (Continuing.) -- they make a judgment as to how much PCBs will be in that sample and then run the analysis?

A Um-hmm.

Q Yes?

A Yes. And if they find they have been wrong and it is off scale on the gas chromatogram, they have to go back and redo that.

Q Does that mean they would have to reset their instruments?

A They would have to go back and do another extraction, another dilution, and try again.

We were hoping to save some time on some of the samples. I think it was a bad idea because actually as a result, as the result came about, it was very different from what our first guess or estimate and it came back very different results.

Q You were trying to give Raltech an idea of what the expected values would be?

A What I was trying to do is attain the results of the samples faster for them, but when we got into it, they found the samples were different than what we thought

it would be, so we just gave up on it and we got back results, obtained results that were different from what they thought.

Q How did you make your estimate?

A We took a look at those borings and we looked to see whether they were near areas that we thought was already contaminated and we took a rough stab.

Q So you based it on location?

A We based it primarily on location.

Q You found out that the location didn't really control what the PCB concentration was?

A Excuse me, I am sorry.

Q That's all right.

A The data result was quite askewed and results came back, the actual numbers that was obtained from Raltech was quite different than what we thought. I didn't believe we actually saved any time by doing it. I think it was a bad idea, myself.

Q What you found was the location of the sample really wasn't a very good indication at all as to concentration?

A Not as a first guess. The data that is projected in the report is what they actually found, not our initial guess.

Q Did you make any estimates, Dr. Nordin, of what effect the dredging would have on the solubility of PCBs with the sediment being released in the water?

A We did some lab studies where we took the sediments and slurried them up with water, assimilating what we believed a dredge would do, and let them settle in a settling column, assimilating what we believed the lagoon would do, and then ran some jar tests, adding polymers, assimilating the sedimentation column, and then ran it through a sand filter and carbon filter.

While we were doing this, we also ran PCB concentration on some of these samples and that is what our estimate is based upon.

Q You found out that PCBs would be dissolved in the water during the dredging operation?

A There would be some PCBs that would be dissolved in water, yes.

Q And there would be some PCBs that would become resuspended in the water column?

A They would be attached to suspended solids and they would resuspend, yes.

Q Those suspended PCBs would settle back down to the bottom?

A Most of them, we hoped, would be taken up

with the dredge, brought over to the lagoon. That is one of the reasons we put in silt curtains and other things to minimize any transfer. We can't control it and say there won't be zero transfer. There will be some.

Q Did you make any estimates of what the transfer would be from the sediments into the water and the suspended solids?

A We estimated what it would be if it were really stirred up, what that water would be. As to how much it would go out in the Harbor, that is an estimate I am not really qualified to say, exactly.

Q Do you know of anyone who is qualified to say what would be transferred from the Harbor across those silt curtains?

A I don't think anybody would be qualified to say precisely how much. Some people may come up with some measures and take educated guesses.

Q Educated guesses?

A Yes.

Q Did you advise the EPA that during dredging, soluble PCBs inside the silt curtains would average 5 to 15 parts per billion?

A 5 to 15 parts per billion? I don't remember

what the number was. We probably came up with some estimate.

Q In the worst case it would be 100 parts per billion?

A I think that would be the upper limit. We base that, again, on our laboratory studies where we stirred up PCBs with water and we got, after we had settled out the solids, it was around that number, around 100, dependent upon the concentration of PCBs in the sediment.

Q If the concentration is higher, the number will be higher?

A Yes, concentration of PCBs, but there is a limit, you have a limit of soluble PCBs in the water. It should not get above that limit solid PCBs.

Q Did you advise EPA that during the dredging, particulate PCBs inside the silt curtains would average 500 parts per billion,with the worst case 5,000 parts per billion?

A I don't remember the number, but I probably have given them the number. I couldn't remember the exact number off the top of my head, what we said.

Q Is it written down anywhere as part of the study?

A Probably. Where it is, I can't say for sure.

Q Could you point out for me in any of the things you prepared where that appears?

A Not offhand. I would have to do some digging.

(Nordin-OMC Deposition Exhibit No. 4 marked for identification, 6/10/82, TLU.)

BY MS. OLIVER:

Q Dr. Nordin, I would like you to look at Exhibit No. 4 which is a handwritten memorandum from a Mr. Tony Rudder to you. Do you know who he is?

A Um-hmm.

Q Yes, you do?

A Yes.

Q It refers to a conversation he had with you regarding the subject matter that we are just talking about. The date of the message is 7/23/81.

Do you remember having the conversation with Mr. Rudder concerning the loss of PCBs during dredging?

A Vaguely, yes.

Q Mr. Rudder notes after speaking to you that the losses would be in soluble PCBs, 5 to 15 ppb's, the worst case being 100 ppb's.

A We were discussing in generalities. It is hard to pinpoint exactly where and what he has done is we were talking, a general phone conversation and he is trying to glean from our discussion and put something down specific, what it would be.

Q You told me earlier that the numbers 5 to 15 on the average and worst case of 100 ppb's. Is that right, is that your opinion?

A That is what we think it would be. I can't really say that it is going to be.

Q Under Particulate - Associated PCBs Inside Silt Curtain would be an average of 500 ppb's or the worst case, 5,000 ppb's. Is that your opinion?

A It is an opinion. We don't have any measurements to say, but we have good reason -- we think now that is what it would be, an order of magnitude.

I don't think anybody can state what it is going to be exactly.

Q In parens it says, "Based on 500 mg/l of S.S. around dredge and 1,000 ppm PCBs, worst case average in solids being dredged."

What does that mean?

A I don't know.

Q Why don't you look at it a minute and tell me

if that refreshes your recollection as to your conversation?

MR. PATTI: Your question is does he know what that means?

MS. OLIVER: Yes.

BY THE WITNESS:

A I would have to have some time to go back and reconstruct it. I'd have to look and see. We were going through some mathematical gyrations to come up with some rough and dirty estimate of how much PCBs would be released.

I would have to go back and try to reconstruct it.

BY MS. OLIVER:

Q Does the parenthetical information provide you with the basis on which you could make your --

A It would help me to reconstruct what our estimate would be.

Q Do you recall that the parenthetical information was the assumption or the basis upon which you made your --

A Probably.

Q -- estimate to Mr. Rudder?

A Probably. You are asking me on a phone

conversation that took place a year and a half ago and I'd have to -- I don't have that recall.

Q Almost a year ago, is that right, not a year and a half?

A You're right, July 23, '81. I stand corrected.

Q Did you prepare the Appendix on Environmental Considerations that appears as part of the Final Report? It is Appendix 2.

A Yes.

Q I take it that the information provided here is based on your summary of other data, is that right?

A Yes. It is a very precursory sum. I wouldn't call this a preliminary discussion.

Q Did you ever have a final discussion or another discussion?

A No, not submitted to the EPA. However, this thinking has changed a little bit from what we said earlier. I think a little bit differently. We had more time to think about it.

This was prepared very quickly, maybe over one or two or three days, something that was prepared very quickly on the basis of number of documents we had on hand or obtained very quickly.

Q You would not consider this to be a complete

analysis --

A No.

Q -- of the environmental --

A No.

Q -- considerations?

A No, it is a very preliminary thing that was prepared.

Q If you look at Page 7, there is a schedule called Justification of Dredging Waukegan Harbor.

Am I correct that the justification for dredging Waukegan Harbor is to prevent bioaccumulation of PCBs in fish that reside in the Harbor?

A That was our understanding when we wrote the report, yes. We have changed that opinion along around January or February since writing the report for other reasons and considerations, but our understanding at the time in writing of the report was what we believed.

Q Is it your understanding that fish do not reside in the Harbor?

A At the time the report was written, there were fish in the Harbor because people caught them. I don't know what the situation is today, if they have some screen or something above it to prevent fish from entering, that may be possible.

Fish go into the Harbor and then they move out to Lake Michigan.

Q At the time you wrote the report, were you given any fish data to look at?

A Hydroscience, Incorporation, Reference 7, we looked at that data.

Q Isn't it your understanding, Dr. Nordin, that the only environmental potential problem with PCBs is through the food chain to humans from fish?

A I believe that to be the major problem.

Q There is also a problem with dermatitis if it comes in contact with your skin?

A Yes.

Q Possibly, is that right?

A Yes, that may be. If I were to prepare that report, that preliminary discussion again today, I would do that differently.

Q Would you change the justification?

A Yes.

Q Do you understand today, Dr. Nordin, that the PCB levels in fish outside of Waukegan Harbor are not any different than PCB levels in fish anywhere else in Lake Michigan?

MR. PATTI: The question is does he know?

MS. OLIVER: Yes, does he know.

BY THE WITNESS:

A I've heard information secondhand that the PCB levels in fish are decreasing, but I have not seen any report or study.

MR. PATTI: I think the question is do you know.

BY MS. OLIVER:

Q You have not been provided with any information, have you, by the EPA?

A Not any tangible information that I can study and base conclusions.

I am going to have to state that I am not really qualified to assess harm as far as fish and people eating fish. I can only draw inferences from what I read.

Q Dr. Nordin --

A We wrote this thing because -- go ahead.

Q Did you write the Environmental Considerations?

A We were asked to as preliminary discussion by the EPA.

Q Were you asked by the EPA to write a justification for dredging of Waukegan Harbor?

A We were asked to provide what we thought would be justification. This is a preliminary discussion of

what we thought at the time and was written in December and done very quickly. The reason why it was done quickly was because we also had to get this report out.

If we had to do that again and even like January or February of 1981, I would not have written it this way. I would have written it differently, but this is nevertheless the document that was prepared and/or a piece of information prepared and put in the report.

You sound like I am confusing you.

MS. OLIVER: Let us take a minute.

(Brief recess had.)

BY MS. OLIVER:

Q Dr. Nordin, do I understand your testimony to be that at the time the final report was submitted to EPA in January of 1981, you had provided them with a discussion of environmental considerations on which you stated that the justification for dredging Waukegan Harbor was to prevent PCBs from accumulating in fish in the Harbor?

A That was our understanding at the time. We have changed our ideas.

Q That was your justification at the time?

A At the time.

Q For making the recommendations, is that right?

A That was one of the major justifications. There is one other justification.

Q Was that the justification that you provided the EPA with pursuant to their request for a justification for dredging?

A That is a preliminary document and --

Q But the preliminary document, Dr. Nordin, provides the EPA pursuant to their request for justification for dredging, with a statement by Mason & Hanger that the justification for dredging is to reduce PCB levels in fish in the Harbor, is that right?

MR. PATTI: He just testified it was one of the justifications.

BY THE WITNESS:

A That is the one, what I want to state is the report is a preliminary report and not a final report and not one I want to hang my hat on because there are other considerations that were not stated in that report.

BY MS. OLIVER:

Q But you testified you never provided the EPA with any other discussion of environmental considerations, is that right? Isn't that what you told me a few minutes ago?

MR. PATTI: Would you read the question back, please?

MS. OLIVER: Let me restate it.

BY MS. OLIVER:

Q Am I not correct, Dr. Nordin, that after you submitted that preliminary discussion of environmental considerations, you did not provide the EPA with any further discussions of environmental considerations?

A Not as a document exactly as is stated.

Q Not as a document like Addendum No. 1 or Addendum No. 2?

A Not like that. I don't believe we were really charged to look at toxic levels in fish and things and even since we submitted that report, our concept and reasons and justification have even changed from what was submitted.

Q Dr. Nordin, what is your justification today for dredging the Waukegan Harbor?

MR. PATTI: Are you talking about Mason & Hanger?

MS. OLIVER: His.

BY THE WITNESS:

A I am not qualified to answer on PCBs' harm, whether they are harmful or not. I cannot answer the fish story. I can only read what is written.

The main argument that I can give today is a logical one: That I read that there is a general

siltation process where there is a net flow of sediments into the Harbor.

I also read or have been supplied information that the Corps of Engineers dredges the Harbor or used to dredge the Harbor and they remove something of about 20,000 or 30,000 cubic yards of sediment per year and they stopped that.

This tells me that there is a general siltation process that takes place. Now, our justification is this: We operate on the premise that this Harbor is to be useful to the general public. That means that sometime in the future in order to maintain that use to the general public, sometime, whether it is five years from now, ten years from now, 15 years from now, 20, sometime in the future, that Harbor is going to have to be dredged. We believe that.

If you don't dredge it, it will eventually silt up and will no longer be useful.

If you change that Harbor, you are going to have to answer. You are going to rattle these PCBs up, stir around, where is that going to go? Where are you going to put the dredged spoils? Are you going to take the dredged spoils and dump it out in the Lake; are you going to send it off to some landfill someplace?

Is it going to be a secured landfill?

Maybe that might not take place for 50 years from now.

Maybe the decision is that we are not going to use the Harbor anymore, but we have operated under the premise that this Harbor will continue to be used and we are concerned that the Harbor will have to be dredged, may be dredged in the future or somebody may put some sheet piling around the shore.

There are several people who own the shoreline and own the property adjacent to the slips and they do different things that modify, stir and rattle up those sediments, so what we are doing is providing what we believe to be a safe way of dredging and contain the sediments and dispose of them.

Q Do you know --

A This is a logical, what we believe to be a logical rationale. I cannot answer the fish story. I am not really qualified to answer the fish story.

We wrote a preliminary justification on basically what we read at the time, but I can't answer if it is true or whether the concepts have changed.

Q Your justification for dredging has nothing to do with any harm occurring to anybody from the PCBs

in those sediments?

A I am not qualified to say what harm is going to occur to anybody or not.

Q If they are left there?

A If they are left there.

Q Do you know where the Corps of Engineers does its dredging in the Harbor?

A It is my understanding that the Corps of Engineers did the dredging up to the mouth. I wish I had a map here.

Page 3 of the report. I was looking at this page here.

Q Page 30?

A It is my understanding that the Corps of Engineers dredged this area, up in here, but stopped right at that point there, what I would call Area C and D on to Lake Michigan, in the report.

It is my understanding that the Corps of Engineers did not dredge up here. (Indicating.) It may have been dredged in the past and we believe it was dredged in the past.

Q So it is your understanding that the Corps of Engineers does its maintenance dredging up to and including Slip No. 1, is that right?

A Yes.

Q In the area that is identified generally as --

A I can't answer for Slip No. 1 for sure, but it does at least up to that area here. I think they do this area up here. I can't answer, but it is my understanding that at least this part here.

Q Up to a little past the mouth of Slip No. 1?

A Yes.

Q In the area that is generally defined as 10 to 50 parts per million PCB area, is that right?

A Generally, yes.

Q Your understanding is that the Corps of Engineers did the maintenance dredging in that area to provide access to traffic?

A It is my understanding that somebody, U.S. Government, part of the Corps of Engineers' responsibility to dredge.

Q Do you know what boat traffic there is in Slip No. 3?

A There are pleasure craft that go up into the upper reaches of the slip. National Gypsum has a boat that comes up to Slip 1 and services are somehow connected with National Gypsum who supplies them with material or loads material on that boat and they go up

there, very large boats.

Q Do large boats go up to Slip No. 3 or --

A No, not Slip No. 3. Pleasure craft do. If a large boat did go up there, it is something I don't know about.

Q If Slip No. 3 were not to be used as it is today for boat traffic, and your understanding was that it could be closed off, in your opinion would there be any reason to dredge?

MR. PATTI: What kind of dredging are you talking about now, maintenance dredging?

MS. OLIVER: No, the project proposed here.

BY THE WITNESS:

A That is a complex question because you also have materials here and you have materials here.

BY MS. OLIVER:

Q Is there an answer?

A Yes, there is, but I am just waiting for you to state it. I am sorry, I am just waiting, I would like a restatement.

Q If your understanding was that Slip No. 3 could be closed to traffic, in your opinion would it require the dredging that Mason & Hanger propose?

A My answer is it is a complex question. There

are some other factors in here that are more complex, are numbered. Do you want me to state what those are?

Q As you sit here today, it is possible, isn't it, that your opinion would be that dredging is not required if the Harbor is not used in the same way?

A There are some other factors. Well, back up a minute.

I said one of our major arguments to justification for dredging is that it would be dredged in the future. Now, if you are stating if we don't do any dredging in the future, there are other considerations, too.

Q What are the other considerations?

A And somebody is going to have to answer how important they are and what if there is a storm? I am not qualified to say there is harm.

Suppose a storm comes and there is a major transfer of sediments? How important is that? What about the volatilization, the inflow of water, the exchange of water there.

There have been some studies available. They don't look too important superficially, but somebody is going to have to rule judgment on it.

Q You wouldn't make any judgment on either the

volatilization --

A I would make an estimate.

Q -- or the movement of water back and forth as affecting the decision to dredge or not dredge? That is not in your area of expertise, am I correct?

A The harm is not in the area of my expertise. Some estimate on the quantity of volatilization and possibly on the exchange of sediments may or may not be in my area of expertise.

Q Dr. Nordin, doesn't the justification for undertaking what you call a complex technical problem, a project like you have recommended, depend on the harm?

A It does.

Q So you have to evaluate the harm in order to evaluate the justifications for dredging, is that right?

A That's true. That's why EPA has many consultants. They don't have just one.

Q What other justifications are there besides movement of water and storm events and volatilization?

A We didn't discuss the fish aspect. Somebody is going to have to make a judgment.

I believe we also have some regulatory requirements that may or may not be waived. I don't

know, but the interpretation I have received from regulatory agencies, Illinois EPA, is that this might be interpreted as a hazardous waste landfill, but it doesn't fall under the definition of hazardous waste landfill, so somebody is going to have to rule on that.

Q What other justifications are there for you to dredge this project?

A The main justification is that this Harbor can be used by the public as well as by the owners, the people, and we don't want somebody to go in there and disturbing whether by dredging or modifying Slip 3 in some way, putting in sheet piles, dropping an anchor and stirring, rattling things up, mixing things up. That has influenced our decision in doing the action as recommended as opposed to leaving it be.

Q Is that today the chief major justification?

A That is the major justification that we have. I am not qualified to answer the fish idea or whether it does somebody harm. That is where you are going to have to look at some other consultant, some other testimony to see that.

(Nordin-OMC Deposition Exhibit No. 5 marked for identification, 6/10/82, TLU.)

BY MS. OLIVER:

Q Dr. Nordin, Exhibit No. 5 is a letter to Mr. Howard Zar from Mason & Hanger dated October 20, 1980, signed by R. W. Cook, relating to some estimated costs for dredging and some other information concerning the proposal.

Did you prepare that letter for Mr. Cook's signature?

A Yes.

Q This was prepared by you in the scope of your work?

A I prepared the letter. I did not prepare the costs, per se. These came from others in Mason & Hanger.

I am not qualified. I did prepare the dredging costs that came from others in Mason & Hanger. I don't consider myself an expert in dredging. I accept the information that is obtained by others.

Q Did you provide the information on Page 2 as to lagoon sizes and water treatment?

MR. PATTI: Which paragraph are you looking at?

MS. OLIVER: The first full paragraph, second full paragraph and last full paragraph. That all relates to water treatment in the lagoon sites.

BY THE WITNESS:

A It is really a joint discussion between Harry Sterling and myself and others of Mason & Hanger sitting at a round table, kind of a joint estimate, and it was based on what we thought the cubic yards were that existed at the time.

These estimates for cubic yards were taken before we went around in our profiles and they were estimated conservatively on the high side. They were based on limited estimates of muck we had in the Harbor. Later on we measured in November and revised our estimate and fortunately I think they went down. I am not sure, but I think they went down.

BY MS. OLIVER:

Q This information was based on the best information or knowledge and the data you had at the time?

A At the time, and our thinking changes.

MS. OLIVER: I don't have any other questions. Thank you, Dr. Nordin.

CROSS EXAMINATION

BY MR. SCHINK:

Q Dr. Nordin, my name is Jim Schink, representing Monsanto.

Based on your review of corroborating data and the other samples that have been done in

the Waukegan Harbor area, is it your opinion that there is a tendency for PCBs to sink into the ground?

A If it is discharged as liquid PCBs or a heavy concentration, yes, particularly if you have sand sediments. That would be the case.

If you are talking about water solids and things soluble in water, I believe that would be more lashed onto whatever sediments were in there and wouldn't really sink down much, but if you have heavy liquid PCBs discharged as a liquid, the globules of liquid coming forth out of the pool, I believe it would settle.

Q Is it fair to say based on your evaluation of Waukegan Harbor data that virtually all of the PCBs that were released in that area were released in the form of liquids and that they have sunk down or are in the process of sinking down into the ground as opposed to being in water solutions?

A I wasn't there at the site when it happened, so I cannot say for sure.

Q But you have looked at a lot of data.

A I have looked at a lot of data. The fact that I have or we found PCBs at very high concentrations at very deep depths tells me or we concluded from it,

we probably didn't really elaborate on the report, but what we concluded is that it tells me that at least some of the PCBs that come out of the pipe must have come out as liquid PCBs as opposed to being only soluble in water.

That was probably some soluble PCBs coming out, too. There is going to have to be a certain amount dissolving in water and coming in contact with liquid. You can't help it.

Q Isn't it fair to say that the overwhelming majority of PCBs that you estimate are existing in the Harbor today have sunk into the sediments or have sunk down?

A Very large majority, it appears today.

Q And indeed, the PCBs that are on the top of the bottom of the Harbor are a very, very small proportion of the total PCBs in the Harbor area, isn't that correct?

A Slip 3, it is still substantial, but Slip 3 represents a very large proportion of the total amount of PCBs, we believe.

Q Let me ask you this:

In Slip No. 3, is it fair to say that virtually all of the PCBs that are there are not in the

upper 10 centimeters of the Harbor bottom?

A I have to go back and look at the data, but we believe that in general there is at least now, there is heavier concentration of PCBs in the deeper sediments than they are in the shallow, real shallow sediments.

Q But in terms of the Harbor as a whole, when you analyzed the borings, you found in most locations that there were PCBs down to a foot, two feet, three feet, four feet down below the top of the Harbor, is that right?

A Generally the data is quite askewed. It is difficult to make a generalization, but frequently we did find that PCB concentrations were higher, not at the very top but some distance from the very top.

Q That is in some cases perhaps a foot or two feet or three feet below the top of the bottom of the sediments, you found --

A And deeper.

Q -- and those PCBs that are there at that point, for all practical purposes, are buried in the Harbor, aren't they?

A Yes, unless somebody disturbs them.

Q Unless somebody comes along, for example, and dredges them?

A Yes, and well, somebody will also have to make a judgment on groundwater migration and other factors that take place.

Q But at least insofar as the Harbor is concerned, the PCBs that are below the very top of the bottom, that is the very heavy concentrations that you found a foot, two feet, three feet below the top of the bottom of the Harbor, are for all practical purposes buried there, is that correct?

MR. PATTI: You are distinguishing the Harbor from Slip No. 3?

MR. SCHINK: I am talking about the Harbor generally, including Slip No. 3.

BY MR. SCHINK:

Q Is that right?

A If nothing disturbs it, they are in a sense buried. Somebody else will have to make judgment on the groundwater migration.

Q I understand that.

A And somebody else also has to make judgment of whether they are going to be disturbed through dredging or some other action.

Q Well, the program that Mason & Hanger recommended for the Harbor includes dredging, does it not?

A Right.

Q And it is not your view, is it, that the dredging will have no effect on the release of PCBs to the water column or to the environment, is that right?

A No, there will be some PCB released.

Q Indeed there will be.

A What we are trying to do is dredge it under a controlled situation.

Q But you certainly in evaluating the adverse effects of dredging tried to look into how PCBs would be released as a result of dredging, is that right?

A We tried to come up with estimates.

Q And you concluded that a dredging program would result in stirring up of the sediments?

A There would be some stirring up.

Q And PCBs would be released into the water above the Harbor as a result of the dredging?

A During the time you did your operation, yes.

Q PCBs would go into solution in water as well?

A They could go into solution as well, yes.

Q Well, the PCB levels if you did not disturb the sediments through dredging would be in the neighborhood of a parts per billion, would they not? That is

as they are today according to your report?

A Probably.

Q If you go in and dredge, I believe you testified you could increase the concentrations to as high as 100 parts per billion?

A For a short time. That may not necessarily mean that it would be that high in the slip right where you stir the sediments. It might be that high initially in the lagoon when you put it in the lagoon.

Q But you did tell Mr. Rutter of EPA that you expected it would be in the neighborhood of 15 to 30 parts per billion?

A We were trying to come up with reasonable estimates.

Q But that would --

A I can't say for sure. It would be high.

Q But that percent would increase between 15 and 30 percent?

A When we did the operation.

Q In the PCBs in the water while you did the operation?

A Yes.

MR. PATTI: I think that was parts per billion.

BY MR. SCHINK:

Q Parts per billion, but that is a 15 to 30-fold increase?

A While you are doing your operation, right.

Q In addition, while you are doing the dredging and while you are taking the water out of the dredged materials, there will be several pounds of PCBs a day that will be volatilized into the air?

A We believe there, based on the assumption of the report -- we don't know exactly how much would be released. It might be less than that.

Q Right, and it might be more. As you point out in your analyses, there are some studies that suggest, for example, that the depth of the material dredged affects the amount of PCBs that would be released to the environment. Is that right, Dr. Nordin?

A There are a lot of different factors that affect it.

Q And indeed your estimation of volatilization losses is just an order of magnitude estimation, is that right?

A It is an estimate based on the consideration, the assumptions that were given in the report.

Q In any event, it is your conclusion, is it not, that while this dredging operation is going on and while

these materials are sitting in the lagoon being de-watered, there will be more PCBs being released to the environment as a result of the dredging and lagoon activity than there would have been if you just left things alone, right?

A Yes. The hooker to that is providing that nobody comes in and does some dredging in the future to maintain the Harbor.

Q Right, but let us just talk about while the project that you have proposed is under way.

During that period of time, there are going to be more PCBs being released into the environment, aren't there?

A During the time there would be more. You can't help it because you are disturbing it as compared to no action at all, assuming no storm or funny thing happened.

You are just comparing that time you are doing your dredging during the time you are just leaving it alone, comparing that time frame versus that time frame.

Q You did not make a separate study of the amount of extra PCBs that will be added to the environment or released to the environment while the excavation that

Mason & Hanger recommended goes on in the North Ditch area, did you?

A Not at North Ditch. That is a little more complex.

Q But the same principles that apply in evaluating the amount of extra PCBs that dredging in the Harbor will result in will also apply to the extra amount of PCBs that the North Ditch excavation project would involve?

A Generally, but you have to keep in mind when you are doing your excavation in the North Ditch area, you don't have a water cap out there. You might be stockpiling these so volatilization could be different.

Q Indeed the principles that you set forth in your volatilization paper suggest that the amount of PCBs that will be released during the excavation in the North Ditch will be greater than the PCBs released during the dredging, is that right?

A If you are comparing the time frame, let's say it takes X number of months to do the dredging, if you are comparing the number of PCBs being released during those months that it takes to do the dredging versus the number of months no activity is taking place and nothing going on, there are no storms or other

screwy things going on, then the amount of PCBs being released as a result of activity would be greater.

Q More PCBs?

A More as a result of --

Q As a result of excavation and as a result --

A You can't help it.

Q That is because you don't have a water cap covering the material in the North Ditch?

A We can try to solve the problem, but we cannot eliminate it.

Q There is also a risk of leaks from excavation?

A There is a risk. As I say, you try to solve a problem.

Q Right, and yet that risk is one that you could translate into an estimate of pounds per day of PCBs that would be released.

A We tried to, based on certain assumptions, yes. And I would recommend that people take measurements and things that take place to try to verify this.

Q And you included, did you not, that during the dredging operation in the Slip No. 3 that several pounds per day of PCBs would be released?

A That is our estimate based on the operation in the report.

Q While the North Ditch excavation goes on, you are going to be taking material, some of which is buried as low as 25 or 30 feet below the surface and exposing it, aren't you?

A Yes, a minimum amount as we can at the time.

Q But there is no way you could dig down 29 feet without exposing soil --

A Yes.

Q -- to the air, right?

A Yes.

Q And when you expose the soil to the air, some of the PCBs that are in the soil are going to be picked up --

A Yes.

Q -- in the air and they are going to be blown if the wind is from the west and the east into Lake Michigan, is that right?

A More volatilized during the period of activity, it would be.

Q And these are PCBs that would otherwise be buried 25 or 30 feet below the surface and would not be volatilized in the air?

A Yes.

Q That is particularly true, isn't it, of PCBs

that are buried currently under the parking lot at OMC where there is an asphalt cap?

A Yes.

Q Are there any other aspects of the dredging and excavation program that you have recommended beside the volatilization of PCBs, the stirring up of PCB sediments and putting of PCBs into solution in the harbor water that would be situations that would make the amount of PCBs in the environment greater as a result of this project?

A Such as what?

Q I am asking you if you identified any other adverse consequences besides those three?

MR. PATTI: Greater in the short term?

BY MR. SCHINK:

Q Let me pursue this. Perhaps I am not clear on it.

Would you agree that during the dredging and excavation, the fact that PCBs will be escaping into the atmosphere is a negative consequence, isn't it?

A Right.

Q That is something you wish would not happen, is that right?

A I want to minimize it, correct.

Q If you did nothing and it would not happen, you would be better off, wouldn't you, during that period?

A On the assumption that nobody comes in and then dredges it in the future to maintain that and also on the assumption that there are no storms to move it around or also on the assumption that nothing else happens to disturb it. There are a lot of factors in that because it is a public use area that you don't have control of and I am talking about Waukegan Harbor.

Q Under the parking lot, for example, you have some control over whether --

A Outboard Marine should --

Q -- whether someone comes out to the Outboard Marine property and digs a hole --

A Yes.

Q -- 29 feet deep?

A Outboard Marine should have control, yes.

Q You also indicated that the stirring of these sediments as a result of dredging was an adverse consequence, is that right?

A Yes.

Q And the putting of buried PCBs into suspension in the water was an adverse consequence of this program?

A It would be an increase in the amount of PCBs.

Q And that is what you would define as an adverse consequence?

A Adverse consequence, yes.

Q Are there other adverse consequences that you can think of associated with this project?

A I suppose somebody may come up with a scenario that some big accident may happen during -- I don't know what that would be.

Q Let us talk about that.

If you assume that the material excavated and dredged cannot be stored on the Outboard Marine property because of government regulations prohibiting such storage and it has to be taken to an off-site facility such as the Williamsburg, Ohio site or the BFI site in Zion, Illinois, you would have to get the material there by truckload, wouldn't you?

A That could be an alternative and there are negatives.

Q How would you get it there if you didn't use a truck? Is there any other way you know of of getting this material you recommend for excavation and dredging to the site other than by truck?

A Okay. You misunderstood what I was trying to say.

I was thinking of that could be an alternative as opposed to incineration or something like that where you tried to destruct it on the site, but if you are talking about transferring it to the BIF or --

Q BFI site.

A BFI site or other location down near Cincinnati, you would probably have to transport it by truck.

Q And you could put about 20 cubic yards on a truck and if you had 400,000 cubic yards of material, you are talking about 20,000 truckloads?

A It is an expense.

Q But in terms of possible adverse consequences, did you make an attempt to determine what the likelihood was of some of these 20,000 truckloads of material spilling material, being involved in mishaps or accidents?

A We considered it. We did not discuss it and we recognize that what we are trying to do is choose what we believe to be the lesser of several alternative evils. None of the recommendations that we recommend, whether it is all these different alternatives, is really

good. They are more or less choosing the lesser of several alternatives and each alternative that I mentioned does have bad aspects.

If you were to transport this thing to another location, Ohio or wherever, there are problems. There would probably be opposition of this truck traffic. There could be a spill that occurs. We recognize that.

Q In fact, didn't you have spills occurring simply in connection with the collection of samples?

A Like what?

Q Are you aware of any of those that occurred or mishaps with the samples?

A I am not aware of any major spills.

Q What about some --

A There may be some, I don't know.

Q You were present while some of those borings were taken, weren't you?

A Yes.

Q Was any of that material spilled?

A Not when I was there.

Q You did not have any reports that that occurred at any time?

A If there were any spills that occurred as a result of taking the samples of borings, it is my

understanding the people were instructed to put it in barrels or drums and treat it as a hazardous waste.

Q Based on what you know about dredging, it appears to you, doesn't it, that dredging is an inherently imprecise operation?

A Things can happen with dredging.

Q You can have lines break and pipes leak and so forth?

A These things happen.

MR. PATTI: You are talking as a general proposition?

MR. SCHINK: A general proposition.

BY MR. SCHINK:

Q Because your report doesn't call for the development of any new dredging technology, does it?

A We were addressed or asked to look at things that we considered were within our frame of things that we could apply now or within the next few years.

Q That is the dredging technology --

A We are not trying to develop new technology.

Q So that the past experience with this dredging equipment would be indicative of the kinds of problems that might occur --

A Yes.

Q -- if you were to dredge the Harbor, is that

right?

A And there are problems that can occur.

Q Did you make any attempt to quantify or evaluate what those problems might be?

A I can't place a probability limit on exactly what the chance of an accident or a spill or thing could be. The only thing I can do is try to protect itself, minimize a chance of a happening or an accident as best you can.

We have predicated this on the assumption that this Harbor would be used and would be continued to be used by the general public as well as by other people who owned land around the shore and this may include somebody that may go in there and dredge in the future.

We are trying to say, let's do the dredging now or within the next few years or whenever it needs to be done, but to do this under a controlled situation so we minimize a contamination or the spread of PCBs. We cannot say there is going to be no contamination.

Q Would you recommend postponing consideration of whether to engage in this dredging until such time as there is an impairment of navigation as opposed to

doing it now?

A I don't think I am qualified to make that decision.

Q Are you aware of any current navigational impairment within the Harbor due to the water depth?

A Right now? There isn't that I am aware of. There's areas in the slip that are quite shallow. I think Larsen Marine may be a better one to judge that.

Q Did you receive any information indicating that the operation of Larsen Marine is being currently impaired as a result of not dredging right now?

A We read there is a general siltation that takes place in the Harbor and that tells me sometime in the future that Harbor will have to be dredged. I can't say when.

Q Is that siltation formed throughout the Harbor or is that siltation that has generally a tendency to occur near the mouth of the Harbor or near the access to Lake Michigan?

A I would say the siltation, judging from the muck depth measurements, I would say the siltation seems to be thickest or heaviest where there is the least amount of boat traffic. It seems to have a correlation, so boat traffic seems to stir this up, so

I don't think it would be uniform throughout the Harbor.

Q Did you give any consideration to whether the Harbor area might not be better off with nothing done as opposed to the dredging you recommended?

A We thought about it.

Q What did you conclude?

A There are a number of factors in there that must be considered. There are people along the Harbor, that is a public use of the Harbor. A lot of people use that Harbor.

There is a chance that PCBs in muck can get disturbed and we are afraid of those chances.

We said, let's go in there and dredge now or let's go in there and dredge in X number of years from now and do this under a controlled situation to minimize the spread of PCBs and dispose of this in a secured landfill somewhere, someplace where it can be contained or can be controlled and we wouldn't have to worry about the spread of PCBs, minimize the ground-water migration and volatilization, isolate it from the public or isolate it from anybody who might likely disturb this.

This has been our overwhelming motivation for doing the recommendation that we did recommend.

Also we do recognize there are laws to describing hazardous wastes and landfill and we wanted to comply with these existing laws.

Q Are you aware of any boat traffic on the North Ditch?

A The North Ditch is a different story. I don't know of any boat traffic on the North Ditch, no.

Q So that the current justification for dredging in the Harbor, namely, at some point in the future you may have to do it to assist the boat traffic, did not apply?

A Would not apply in the North Ditch. North Ditch is a different situation.

Q Were you asked to determine a justification for taking the remedial action that you proposed there?

A Remedial action, we did the action that we recommended as we wanted to isolate the PCBs as much as possible from any further spread and we thought this was the best way.

Q What about a justification for doing that in the hundreds and millions of dollars that may be involved in doing that?

A Okay.

Q Is that the justification?

MR. PATTI: He just told you what the justification was.

BY MR. SCHINK:

Q Is that the justification?

A We wanted to keep it isolated. Now, whether this isolation justifies, and I am talking about North Ditch not Waukegan Harbor.

Q By North Ditch, you are talking about the parking lot, the Crescent Ditch, the Oval Lagoon?

A Yes, right.

Now, I think I am not the one to make that decision. I think other people are going to have to make that decision.

Q But your report recommended massive excavation in that area, is that right?

A Yes, and we would like to see it on the basis we wanted to see -- we would like to see that it is isolated.

If someone can come along, some other consultant can come along and consider all the different consequences and, yes, there may be some spread of PCBs up in the North Ditch, but the harm is measurable or the spread of PCBs in North Ditch is measurable compared to what they would be if you excavated, then I

have no strong feeling one way or the other. That's personally right.

Q Indeed, it was your observation, was it not, that with respect to the North Ditch area, including the Oval Lagoon and Crescent Ditch, that the impact of PCBs there on the human food chain would be minor because humans are not likely to consume any wildlife which feed or exist around the North Ditch, is that right?

A I think it would be minimal. I believe you are correct.

I think that a stronger case could be made for the North Ditch not taking any action in Waukegan Harbor, but we did predicate it on the assumption that we wanted to isolate the PCBs and have them contained in one spot.

We are not getting rid of all of the PCB and putting it in one spot. We are taking what we believe to be a major portion of them in a place where we believe we can monitor and control and minimize the spread of groundwater and that kind of thing.

Q And the concern was that if you did not isolate the PCBs in the North Ditch, there might be some 10 pounds per year of them entering Lake Michigan?

A There would be some quantity entering Lake Michigan, some quantity volatilizing. You would have less control if there were a major accident that happened at some time, a storm event or whatever that may be.

Q Isn't it fair to say that based on your review of the data regarding the entry of PCBs into Lake Michigan, that the estimation of PCBs entering Lake Michigan currently from the North Ditch shows that those PCBs are absolutely infinitesimal as compared to PCBs coming from other sources?

A It is much smaller.

Q Much less than one-half of one percent, isn't it?

A A number of probably that low magnitude.

Q Or might be even smaller?

A Might be smaller, might be larger, but it is not to my understanding currently a major source of PCBs coming from North Ditch. That is assuming we don't have any measures in that stirring or riling things up.

Q You do not have any reason, however, to disagree with the conclusion of the Government experts who have looked into the quantification of the current contribution of PCBs from the North Ditch to Lake Michigan,

do you?

A None.

Q And in fact --

A Again, I will have to qualify this: Assuming there is no major storm or nobody comes up there and disturbs it. Now, I can't say what is going to happen a hundred years from now.

Q No, we are talking about right now. If tomorrow you could have a magic wand and all of the PCBs on the Outboard Marine property magically disappeared and all of the PCBs in the Harbor magically disappeared, based on the data that you reviewed regarding other sources of PCBs in Lake Michigan, isn't it fair to say that getting rid of Waukegan Harbor PCBs would have no measurable effect on Lake Michigan PCB levels?

A I don't know on the "no measurable effect," but I believe from what I have read that the other sources of PCBs to Lake Michigan, the Volatilization Study actually states that, that the other sources of PCB to Lake Michigan appears to be quite a bit greater than OMC's input from the OMC property, assuming these things are not disturbed.

Q It is not just quite a bit greater, it is well

less than one-tenth of one percent of PCBs entering the Lake are calculated by the Government experts to come from the Harbor and Outboard Marine property, is that right?

MR. PATTI: Mr. Schink, I think he has answered the question.

BY THE WITNESS:

A The question is answered right in the report. Let's quote that.

MR. PATTI: Which report are you looking at?

THE WITNESS: The Volatilization Study. It is a matter of finding the right page.

It is Page 12, one estimate. It's Eisenrich, also published estimates of PCBs and other chlorinated organics to each of the other Great Lakes; total input of PCBs as follows: Lake Michigan, 6,900 kilograms per year.

The 6,900 kilograms per year total for Lake Michigan is in the same order of magnitude as Murphy's estimate of 4,800 kilograms per year in rainfall and 2,500 kilograms per year, dry deposition.

Now, you compare that with the number that you have given of 10 pounds per year or whatever number was quoted from the North Ditch for sediments and

probably some volatilization and also from Waukegan Harbor and assuming nobody comes in and disturbs all that, which I have no control of, then what you have stated is we are talking about a much greater estimate of PCBs coming from Lake Michigan than from other sources. I think that is what you want to hear.

BY MR. SCHINK:

Q That is a fact, isn't it?

A That is my understanding. I have no reason to doubt Eisenrich's and these other people's studies.

Now, somebody else might come along and come up with a different estimate.

Q You would agree, would you not, that after the program that Mason & Hanger has recommended is completed, there will still be PCBs in Waukegan Harbor?

A There will be some.

Q Indeed there will be some pockets where PCBs are more than 100 parts per million?

A There will be some.

Q There will be some areas where PCBs in the sand would exceed 100 parts per million?

A There would be some.

Q Did you make any determination of what the contribution of PCBs to Lake Michigan would be from the

Waukegan Harbor after you got done with the dredging program?

A There would be initially a higher concentration. I would expect there would be a higher contribution to Lake Michigan initially and then this would taper off and then it would be less of a contribution of PCBs to Lake Michigan than if you did nothing.

Q I believe you testified that during the dredging operation, PCBs that were buried would be in solution in the water and would be part of the particle sediment that would be stirred up and suspended in the water, is that right?

A Yes.

Q You stop your dredging and those PCBs that are adhering or clinging to the sediment would then settle on the bottom, wouldn't they?

A Yes.

Q Did you make any attempt to determine what the concentration would then be of the PCBs on the uppermost sediments in the Harbor?

A After dredging?

Q Yes.

A It would be, we expect that, and I can't say exactly how much it would be, but it would be repre-

sentative of the sediments that are still in the Harbor.

Q Is that what you would expect --

A We asked the dredger to go around and if there is concern of this, this can be tightened to go around and when he is all done and then go around with his dredge and remove the residual sediments. And if we were concerned about this, he could scoop some of the sand and remove this. This is an additional expense and we didn't discuss this, but you can't get all of the PCB sediments in every little corner that might exist.

Q You say you can?

A No, you can't.

Q You cannot.

A Not easily, not without going through a lot of additional expense. I don't think it is justified.

Q That is why you said as a specification that the amount of material removed would represent only 98 percent of the muck and not 100 percent of the muck, is that right?

A And that 2 percent --

Q There is no guarantee that that 20 percent of the muck would not contain the most highly contaminated

portions of the muck, is there?

A Hopefully not, but there will be some.

Q Indeed you calculated that there were several hundred thousand pounds of PCBs in the muck to be removed in Slip No. 3?

A In some locations, yes, sediments; yes.

Q In Slip 3, you calculated there were several hundred thousand pounds of PCBs, is that right?

A Yes.

Q And if 98 percent of that material is removed, you would still expect several hundred thousand pounds to remain?

A If it were uniform throughout the sediment, probably yes.

Q Because it could be more than several hundred thousand pounds if the 2 percent of sediments remaining happened to be among the more highly contaminated, is that right?

A Yes.

Q Did you make any effort to determine whether it was likely that there could be a problem with the collapse of some of the sheet pilings?

A Yes.

Q Around the Harbor during the dredging?

MR. PATTI: Wait till he finishes the question.

THE WITNESS: Sorry.

BY MR. SCHINK:

Q Did you look into that?

A Mason & Hanger did. I didn't.

Q I gather it is a problem that may occur as you dig up these muck sediments, isn't that right?

A Mason & Hanger did look into this. That is why it's going to be somewhat difficult to get right up at the bulkhead.

Q Because by getting up close to the bulkhead, you might remove some of the material that is supporting the steel lining and it might collapse, is that right?

A There could be a possibility of that happening and looked into.

Q Isn't there a possibility of a lot of things happening down there because you really don't know what's down there?

A A lot of things can happen. Again, going back to the initial problem I stated several times before, that is, we made the assumption that the Harbor will continue to be used and this tells me that somebody is going to --

Q My question, though, Dr. Nordin, is --

A My coming in and dredging and we are outlining a way of doing this dredging in a safe manner and disposing of sediments in a safe manner.

Q But isn't what you are recommending here a little bit like a doctor performing an operation on an elderly patient; that is, a doctor makes a diagnosis of something he wants to do and he begins to do it and once you perform the surgery you are not quite sure what you are going to find?

A I dont think that is a fair question.

MR. PATTI: I object to the question. It is impossible for him to answer. It is argumentative.

BY THE WITNESS:

A It is not a fair comparison.

BY MR SCHINK:

Q You would agree, wouldn't you, that dredging is not an exact science?

A A lot of things can go wrong with dredging if you think about it, but a lot of things can go wrong if you don't dredge.

Q Did the Corps of Engineers ever advise you or anyone from Mason & Hanger that it was their opinion that silt curtains were not an effective means of containing

the PCB-bearing sediments that will be disturbed and agitated as a result of dredging?

A I think that is a question that better be addressed to the other people at Mason & Hanger.

Q Did you ever hear reports that the Corps of Engineers has voiced objections or reservations about the use of silt curtains?

A I think I recall there was a concern that we would be able to contain the PCBs of any sediments, so we want to minimize this and put a double silt curtain and to do some testing and if there is some spread, if need be, put in some polymers and things to try to settle this material. There are a lot of unknowns here.

Q I gather that these unknowns are such that as you sit here, you cannot say that it might be better not to do anything up in the North Ditch area, is that right?

A We were talking about the Harbor and now we are jumping to the North Ditch.

Q I understand. There are a lot of unknowns as well.

A There are a lot of unknowns, yes.

Q There are similar unknowns up there in terms of

a --

A There are a lot of unknowns. I think a stronger case can be made for not doing anything in North Ditch than in the Harbor, that is my personal opinion, but we nevertheless in our report predicated that we were going to isolate this material and put it in a place where it was going to be contained and we could know where it is going to be contained.

Q That is because you were told by the EPA that your job was to come up with some method of containing or isolation of the material on land, is that right?

MR. PATTI: There has been no testimony to that effect today. Lay a foundation, Mr. Schink.

BY MR. SCHINK:

Q Do you understand the question?

A I understand the question. EPA didn't tell us. I don't know what EPA wants.

MS. OLIVER: Nor do we.

BY MR. SCHINK:

Q You indicated that before the draft of the January report was submitted to EPA that to your knowledge, to use your terminology, it was "doctored up" at Mason & Hanger, that it was revised in some way, is that right?

A We submitted a preliminary report.

Q To EPA?

A To EPA.

Q After it had been doctored up at Mason & Hanger?

A And then we submitted a final report.

Q Did you receive comments from EPA about your draft report?

A They were comments and notations of EPA, mostly of an editing nature.

Q Did you change any of your conclusions?

A I don't recall any major conclusions that may have been changed. Now, if you are talking about any conclusions, I guess the way to answer that is to go through and start looking at specific items.

Q As you sit here today, do you recall any conclusions, major or minor, that may have been changed as a result of a suggestion or correction of EPA in response to your first draft that you sent them?

A I don't recall of any conclusion that changed the content of what we recommended as a result, any editing. There was some wording that was changed and some sentences that were changed and we also added some more Corps-borne information that we didn't have available in the preliminary draft. Some more came through

and we added that.

Q If you had to do the study over again, would you do it in the same way?

A Well, we were operating under a severe time frame in doing the study. I think we would come up with the same conclusion that we did, assuming we still had the same information that we had, and there are some minor things that we would have changed.

For example, the justification for doing the dredging in the Harbor, I would have estimated -- or when I say I, I am speaking of Mason & Hanger, because these are not my conclusions.

These were taken, sitting down at a table like we are doing and discussing back and forth, but I think we would have emphasized the people going in there and obviously disturbing the sediments if we left it alone by dredging, whoever that may be.

We may say nobody is doing any dredging now, but you can't say 25 years from now.

Q Did you see any data that Argonne Laboratory collected with respect to the bottom currents in Slip No. 3?

A There is a summary of that data in the report.

MR. PATTI: Did you see the data? That is the

question.

BY THE WITNESS:

A Yes, some of it. I am not sure if you are thinking of the same data that I am.

BY MR. SCHINK:

Q Did anyone tell you that Argonne Laboratory put a current meter in Slip No. 3 for six months and was never able to find a current that they were even able to measure? Were you ever told that?

A No, but remember they did this for a limited time.

Q For six months. Do you consider that to be a limited time?

A Yes, because you can have a 25-year storm or a 50-year storm event that can drastically change things and that is the sort of thing that is hard to predict.

Q Do you know how long PCB-bearing materials have been in Waukegan Harbor?

A I believe they have been in there since the '50s and '60s.

Q They have been there 25 or 30 years at this point?

A Yes.

Q Have you seen any evidence based on your very

extensive borings and analyses indicating to you that significant quantities of PCBs have been moved out to the mouth of the Harbor or out into Lake Michigan as a result of any kind of an unusual weather occurrence or storm occurrence?

A There was a storm event that took place in 1957 or 1960, I forget the year, when there was some flooding that took place, and I don't know how much PCBs migrated at that time.

Q Or if any migrated. You don't know that?

A I wasn't around to measure, but I would presume there would be a measured amount.

Q Did you consider it significant that the borings taken out by the point where the Harbor enters the Lake showed very low levels of PCB in the sediment?

MR. PATTI: With respect to what?

MR. SCHINK: With respect to the question of whether at any time since there have been PCBs in the Harbor there had been a major storm that resulted in a movement of them out of the Harbor.

BY THE WITNESS:

A The mouth of the Harbor is a lot more open area and if PCBs get to the mouth of the Harbor or to the mouth of North Ditch, they are more, I believe they

would be more readily dispersed and would be replaced by new PCBs, would be dispersed in that way.

BY MR. SCHINK:

Q Is there anything else, any other areas of the report that you think should be done differently if you had to do it over again beside the justification?

A I would do the sampling very differently if I could.

Q Why, why would you do the sampling differently?

A I understand how it is done. It is done by a number of different research and this is good. I think that might be, I think it is okay.

Q You think the sampling locations gave results which were representative of the amount of contamination and the amount of material to be removed?

A I don't know, but I would choose a sample location differently than it was in the report. It may show higher PCBs, may have some lower. I would hope it would show lower PCBs.

Q Why would you choose different locations?

A If I were to do this over again, let us talk about the Harbor.

Q Yes.

A I would take some initial measurements here

and there near the outfall, a few categories here and there to see whether there is PCB contamination or not because I don't want to go under the assumption that I don't know the answer.

Having verified that, I would go to the Phase 2 program and take a more extensive sampling or probably lay out a grid up in, let's say the initial sampling shows a higher concentration in Slip No. 3. I would lay a grid out on PCBs. I wouldn't try to concentrate them all near the outfall because that might bias my results and come up with a higher number of PCBs than I would average. I would set up a grid and spread it out all over, uniform grid. It would be depending on the dollar amount I had for sampling, would depend on how many samples, but I would take them throughout this numbered slip, Slip No. 3, and do it at uniform locations.

Then I would do the same for the rest of the Harbor, according to a defined pattern or grid that I can recognize.

Q This was not done in any of the sampling data that you saw?

A It was more random. That does not mean the results were invalid, but I believe if it were done

this way, I would come up with a better estimate of the pounds of PCBs.

Q In your scientific judgment, if you want to get a reliable determination, one that you would be willing to stand behind as a scientist, you would want the samples to be taken in a manner you just described?

MR. PATTI: I am going to object to that. He didn't say that what has been employed in the report is unreliable.

THE WITNESS: It is not.

MR. SCHINK: I did not ask that question. I move to strike the answer.

BY MR. SCHINK:

Q My question is to you as a scientist, if you wanted to come up with results which you considered to be reliable and you would stand behind as a scientist, you would want the sampling to be done in the way you have just described?

A Depends on what your objective is. If your objective is to show that PCB contamination exists and about where it is, I don't see anything wrong with the way it is done now.

But if your objective is to come up with estimate of pounds of PCB, what is the total number of

pounds of PCB up in the Harbor and up in Slip 3, then I would prefer that it would be done this way and I describe that method in Addendum No. 2 of the report.

Q If you wanted to reliably determine the amount of material to be removed, you would want to use the same sampling technique that you have just described in order to get a reliable determination that you would stand behind as a scientist?

A I would use the same sampling technique.

Now, here we are talking about the estimate of quantity of muck and that is different from analysis of PCBs. I would use the same method in the report and if funds were available, I would probably go around and take other measurements at a later date and see if the depths of the contours have changed.

Q So in your view, the method that was used to determine the amount of muck to be removed was a reliable method that you would use again if you were asked to come up with that number?

A Yes.

Q But I understand that it is your belief that the number you came up with is one that is only accurate to an order of magnitude, is that right?

A You are talking about pounds of PCBs --

Q No, I am talking about the amount of material to be removed from the Harbor.

A That, I believe, is not, if your definition of order of magnitude is plus or minus a factor of ten --

Q No, it is what the dictionary defines it as which is that number plus a factor of ten which is, if you say the order of magnitude is one, that means if it's one, two, three, all the way up to ten, it is in the same order of magnitude.

A The definition of order of magnitude as used in the report was used loosely and you are going to have to look in the context in which it was used.

It does not necessarily mean that the context that it could be off by a factor of ten.

In the case of muck sediments, I believe you can go out there and if you have a reasonably calm day, let us say you are measuring a 4-foot depth segment, your accuracy in your measurement is plus or minus several inches. I am going to say five or six inches.

You could be off on that and in a 4-foot depth, it is plus or minus four. You go off and measure another sample in a different location, you might be a little high, another one a little low. By the time you average all this up in a grid, which we did do, your

estimate on a quantity of muck is going to be better an estimate than say, plus or minus a factor of ten.

Q But it is your testimony that over the years, there is more and more of this muck.

A It is going to change.

Q And it is going to increase?

A I am talking about the time when the sampling was done in November of 1980.

Q If you have additional factors that more material is going to come in and it is going to change, and as more material comes in, there is going to be more muck to be dredged?

A Yes.

Q For that reason, among others, you would anticipate that as time goes by, your estimate of the material to be dredged has to be increased, is that right?

A It would probably have to, yes.

Q By how much?

A It is hard to say. We specify in the dredging that the person doing the dredging go around and re-measure the quantity of muck and we allowed in the design for having a larger lagoon to hold a larger quantity of muck than is specified, that amount.

If somebody waits 50 years from now and you have a much greater quantity of muck, let us say on the order of several million cubic yards, then the design is off, but let's say somebody comes in several years from now and let's say 20,000 cubic yards of muck comes in and you know the design is big enough to say that you are going down to 50 parts per million or whatever level you decide, the design has enough flexibility and the lagoon size can handle more muck. There is leeway in that design.

Also, we, toward the mouth of the Harbor where we had less information, we did estimate that conservatively which means on the high side.

Q Given the additional releases of PCB to the atmosphere and Lake Michigan if that will occur as a result of the dredging project, and given the fact that you don't have any information indicating there is any problem with navigation or ships in the Harbor right now, is it your recommendation that the dredging project that you propose be deferred until such time as there is a navigational problem?

MR. PATTI: I think you have already answered that question.

BY MR. SCHINK:

Q Can you answer that question?

MR. PATTI: If you can answer the question, please.

BY THE WITNESS:

A I am not really sure if I can really answer that question, whether it can be deferred until you get a navigational problem or not.

Maybe there will be a navigational problem and maybe somebody wants to go in there and dredge and increase the size so they can bring some boats -- maybe the funding is not available and it is quite complex.

BY MR. SCHINK:

Q Given the fact that your justification for Harbor dredging stays primarily a concern about whether boats can move in or out of the Harbor, in view of the fact that when the dredging does occur there will be these added releases of PCBs to the water and the area, and given the uncertainties and given the complexity of the problem and given the enormous cost of the problem, is it your view that it should be deferred until such time as there is a clearly defined navigational need?

A I would hesitate to recommend it be deferred. I think somebody else would have to make that decision.

You made that one statement about boats

going in and out of the Harbor. There are a lot of other things that can happen to disturb that body besides the necessity for dredging for boats to go in and out and there are a lot of other actions.

Q But those are all hypotheticals. You don't have any evidence of those things having occurred, do you?

A My knowledge, there hasn't been any recent dredging in the Slip 3 area, upper reaches of the Harbor.

Q You don't have any evidence that anybody has put in or contemplated putting in sheet piling, do you?

A Not now. It has been done in the past. It has been done in the past at various times.

There have been changes in the upper part of the Harbor. There have been --

Q But prospectively in terms of from here on out, do you have any evidence that anybody has any plans of putting in any sheet pilings?

A I don't know if anybody has any plans to put in any sheet pilings. I can't answer that for five years from now.

Q You would agree it would be cheaper to put in

sheet piling than dredging the Harbor, wouldn't you?

A It is cheaper not to put in sheet piling?

Q Right. If your alternative is you dredge the Harbor and put in sheet pilings or you don't dredge the Harbor and don't put in sheet pilings, the "don't dredge the Harbor" is a far less expensive alternative, is it not?

A It would be far less expensive not to do anything. I think everybody would admit that because I think somebody has to answer that question. This is a public harbor and a lot of people do things on the Harbor whereas somebody is going to dredge or somebody is going to change something or maybe there will be an accident and the boat sank or who knows what. You are going to be disturbing --

Q Isn't it cheaper if a boat sinks to lift it out of the Harbor than to spend hundreds of millions of dollars to dredge?

A As you lift it out, you would be spreading PCBs by that action.

Q Isn't there a way of lifting the boat out to minimize that in the same way as there is lifting sediments out to minimize it?

A There probably is. Maybe there might be

people aboard that boat and divers going in and exposing themselves to PCBs. A lot of things can happen.

Q You think that those are the kinds of risks that in your view justify the necessary expenditure to engage in the dredging project?

A These are the kinds of risks, the possible future dredging that we are qualified or we feel common sense tells us to answer. There are other risks, too, but I don't feel qualified to answer and that is the fish. Somebody has to address that. Migration --

Q Let us assume the data shows the fish are safe, healthy and abundant and complying with the FDA standards.

A Well, I don't know if they do or not.

Q Let us just assume, assume that the data generated in this case that EPA didn't show you showed that the fish are safe, healthy and abundant and that there has been testimony and there is evidence to that effect.

MR. PATTI: What is the purpose of the assumption?

MR. SCHINK: I am asking him to assume that because he keeps relying on in part, well, there may be a fish problem.

MR. PATTI: You keep asking him about hypothetical

questions.

MR. SCHINK: No, I am not. There has been received in the record, there is testimony --

MR. PATTI: He has testified, I believe, that he cannot read a crystal ball. He testified that.

MR. SCHINK: My hypothetical is based on testimony in this case.

BY MR. SCHINK:

Q If you assume that there are data and the Illinois Department of Conservation people have the responsibility for the fish in the Illinois waters of Lake Michigan and find that the fish are safe, healthy and abundant and are safe as defined by the FDA, would that change your opinion regarding whether the Harbor should be dredged?

A It would be a good argument. I want to state --

Q I didn't ask you that. I asked you whether it would change your opinion.

A It may influence our decision because that is one of a whole bunch of other factors.

Q But you indicated that initially the situation with the fish was the principal justification, is that right?

A That was our initial --

Q And that is indeed the only justification you discuss in your preliminary report, correct?

A In that report, that is just preliminary.

Q Just that, but that is also the situation with the fish, was the only justification you discuss in your report, is that correct, in your preliminary report?

A It is the only one that you can, I believe, answer --

Q It is the only one you discussed, isn't it?

A Yes, in detail.

Q It is the only one you discuss under the heading Justification.

Did you discuss any other justification besides fish in the preliminary report?

A Not that portion, no. I would have to go back and look through the argument about further dredging.

Let me make a statement --

MR. PATTI: Go ahead.

MR. SCHINK: Let me just ask the questions.

BY MR. SCHINK:

Q At the time of your preliminary report which was a year and a half ago, your justification as described was based on the fish situation, is that correct?

A Yes.

Q I am asking you to assume today that the fish situation is such that they are safe, healthy and abundant as defined by the FDA, today, right now, out there in the Illinois waters of Lake Michigan, right now in the Waukegan Harbor.

MR. PATTI: Healthy defined as what?

MR. SCHINK: As that term is used by the Illinois Department of Conservation in a description of those fish.

BY MR. SCHINK:

Q Do you think that the dredging project you have recommended should be revised?

A I don't know. There are other factors --

Q In other words, if the fish are safe, healthy and abundant --

A And if you can prove it, that would be a good strong argument.

Q And that would cause you to want to reexamine your recommendation, is that right?

A Let me say --

Q Is that right?

A We would want to relook at it.

Q You would?

A Yes. There are other arguments --

Q No, I am just asking you about your recommendation.

A There are a lot of other factors.

MR. PATTI: Mr. Schink, he said they would reexamine it.

BY MR. SCHINK:

Q Have you been asked to reexamine your opinion in light of the fish data that have been developed since you prepared your preliminary justification?

A We have not been asked to.

Q Have you been furnished any subsequent fish data information by your client, U.S. EPA?

A I don't know of any.

MR. SCHINK: I have nothing further.

THE WITNESS: Let me state this was a preliminary thing based on what we understood at the time. We were not asked to justify that since then.

BY MR. SCHINK:

Q Did anyone from EPA tell you your original justification was wrong?

A Since the report was written?

Q Yes.

A It was discussed.

Q When was it discussed?

A About two weeks ago.

Q With whom was it discussed?

A I have a mental block.

MR. PATTI: Do you want to take a break for a second?

THE WITNESS: Yes.

MR. PATTI: Do you mind?

MR. SCHINK: Do you have a name you might give him to refresh his recollection?

BY MR. SCHINK:

Q Was it an employee of U.S. EPA with whom you had this discussion?

A No, it was one of the attorneys.

Q One of the attorneys. Was it just you and this attorney?

A Um-hmm, and it was in a room full of Mason & Hanger people.

Q With Mason & Hanger people?

A Yes.

Q Was that in connection with your preparation for this deposition?

A Yes.

Q Were you told by an attorney from U.S. EPA that you should change your justification?

A No.

Q Were you told by an attorney from the U.S. EPA that the justification you gave a year and a half ago was wrong?

A Not wrong, but the argument -- I don't remember the exact wording, is weak or may not be valid.

Q That the argument about fish is weak or may not be valid?

A I can't really --

Q Did they show you any data?

A No.

Q Was it a woman or a man with whom you spoke?

A A man.

Q It was not Mr. Patti?

A No.

Q And you say there were other people from Mason & Hanger as well?

A Yes.

Q Was there any further discussion at the meeting regarding why your original justification was weak or may not be valid?

A No.

MR. PATTI: To the extent this whole line of inquiry represents information or discussions that may

be in some way privileged, I am going to object to the line of inquiry.

BY MR. SCHINK:

Q Does Mr. Patti here today represent you in your personal capacity, Dr. Nordin? He is not your personal attorney, is he?

A We were charged --

Q Is Mr. Patti your personal attorney? He is not, is he?

A No.

Q Let us go back then to the meeting.

A We were charged to look, it is stated right on our report what we were charged to look at. We were not charged to look at what fish was and we had some preliminary information. It was sketchy and we wrote up a preliminary study and -- we wrote up a preliminary study and that is the preliminary. It is that.

MR. PATTI: You are talking about the January '81 --

THE WITNESS: Yes, January '81. It is preliminary.

BY MR. SCHINK:

Q You are talking about the preliminary justification?

A I told you before I am not qualified to make any decision on fish. I don't have any data, I didn't

do the work.

Q Are you qualified to give justification based on navigational dredging needs?

A I am not, but I think we would be in a better position as do Mason & Hanger to give justification for the navigational. It is common sense.

Q It is more than common sense, isn't it?

A Yes.

Q Navigational dredging and navigational needs is an area that has been committed to the Army Corps of Engineers, isn't it, by the Constitution of the United States, if you know?

A And U.S. Public Water and some of that water I understand to be privately owned, in the slip.

Q Let us go back to the meeting.

A So you also have people who own the property adjacent to the slip and they also --

Q Who was at this meeting two weeks ago with the representative of the U.S. EPA besides yourself and the people from Mason & Hanger?

A This would be Mr. White.

Q It was just you and Mr. White and the attorney from U.S. EPA?

A Just Mr. White.

Q Just Mr. White from Mason & Hanger?

MR. PATTI: Mr. Jim White.

THE WITNESS: Mr. Jim White.

BY MR. SCHINK:

Q You were the only person from Mason & Hanger at that meeting?

A No, other people from Mason & Hanger were present at the meeting.

Q Who else was present at that meeting from Mason & Hanger?

A Russ Cook, Harry Sterling, myself and Marion Lail.

Q Was Mr. Snedden there?

A At times, but not during the whole thing, just kind of in and out.

Q Was that meeting here or down in Lexington?

A In Lexington.

Q How long did the meeting last?

A Two days.

Q Two days?

A I am trying to think -- just a minute. I think it was two days, might have been part of a third day. I would have to go back and look.

Q What was discussed at the meeting?

A Mainly most of the things that were discussed at that meeting is that he sat and listened when we went through our report and he asked us what we recommended and we told him what we recommended. He did not try to influence our decision or try to change.

Q What you told him is what is reflected in the various documents --

A Various reports.

Q -- that Mason & Hanger submitted?

MR. PATTI: Mr. Schink, he has given you a general direction of the meeting. I am going to direct the witness not to answer any further inquiries because of relevant concerns of privilege that may be associated with these communications.

I have been more than fair in this regard. He has given you a general description of the meeting, the length of time it took to meet, the persons present and that's it.

BY MR. SCHINK:

Q Dr. Nordin, was there any discussion at the meeting regarding the navigational justification for dredging?

A We told him what our opinion is. He didn't try to put words in our mouth on that or try to influence

it.

Q Who came up with the idea of the navigational justification for dredging?

A Mason & Hanger did.

Q They came up with it before the meeting?

A Oh, yes.

Q Who asked them to come up with that justification?

A We discussed that.

Q When was that?

A When?

Q When was it that Mason & Hanger developed the navigational justification for dredging?

A About the time the report was submitted and shortly thereafter.

MR. PATTI: This was January '81?

THE WITNESS: January '81.

BY MR. SCHINK:

Q Did you in connection with your consideration of the navigational justification --

A When you are talking about navigational justification, I am assuming that we have looked and said there is a net inflow of sediments into the Harbor and this tells me at some time that --

Q Let me tell you what I mean by navigational justification. I want to be sure we are communicating properly.

You testified earlier that your preliminary justification that there was a fish problem.

A Yes.

Q That you subsequently came up with a justification that at some point in the future, the Harbor would have to be dredged and that that was a concern which in your view would justify dredging, is that correct?

A Major concern. There may be other views.

Q I would call that navigational justification.

A All right.

Q Did you prepare any papers or studies or report regarding the navigational justification?

A No.

Q I am correct, am I not, that navigational justification is not discussed in any report that Mason & Hanger prepared --

A If there is, I cannot recall it.

Q -- for U.S. EPA?

A If there is, I cannot recall it.

Q It was not intended to be discussed?

A It was not discussed as a separate item, but maybe mentioned somewhere in the report. I can't say.

Q But I am correct, am I not, that it was not your intention as you sit now as the principal author of the 1981 draft to discuss the navigational justification?

A We didn't come out very strongly on it. It was discussed. This is something that developed on our part later, not as a result of EPA. We said, look, there is net inflow of sediments into the Harbor. This tells us, the Corps of Engineers are dredging X number of cubic yards per year.

Now, they have stopped and there are more sediments coming into the Harbor. It is logical to conclude that this means that the Harbor, we predicated that the Harbor will continue to be used at some time in the future and that Harbor will have to be dredged. When that would take place, I don't know.

Q What data did you rely on to reach the conclusion that there was a net flow of sediments into the Harbor?

A I couldn't say what day.

Q What data, data?

A Oh, data.

Q Data, information.

A It is in the report.

Q Could you indicate where in the report you mentioned data that shows a net flow of sediments into the Harbor?

MR. PATTI: Can you put your hands on it, Doctor?

THE WITNESS: That is what I am looking for.

Page 24, third paragraph:

"Historically, the U.S. Army Corps of Engineers has dredged an average of 30,000 cubic yards per year of sediments near the main entrance channel using mostly dipper dredges. No dredging has taken place within the Harbor since PCB contamination was discovered in 1976..."

BY MR. SCHINK:

Q What does that tell you?

A If they are doing dredging and they're doing this amount each year, that tells me that there is sediments that come in as one factor.

Q In other words, you conclude based on that information --

A It is also another study, may not have been quoted in the report.

Q Are you familiar with the Argonne Study?

A Argonne Study.

Q That indicates a net flow out of the Harbor?

A Of sediments?

Q Yes.

A That could be a net flow out and could be a net flow in.

Q What was their conclusion, do you remember?

A No, I don't.

Q Did you review that study?

A Yes, I did.

Q Did anyone advise you that their conclusion was there was a net flow out and that was the means of transporting PCBs from the Harbor to the Lake and was of concern --

A I would have to review that. We have to review that study.

Q Let me ask you this --

A There is a flow in and a flow out. We also have sediments and if the Corps of Engineers --

Q But the dredging they do takes place in the main channel of the Harbor in the south end. It does not take place in Slip 3 or the other areas where you define contamination of PCBs being present, is that right?

A Yes.

Q So it does not necessarily mean that there is any build-up of sedimentation in that area, does it?

A I turn that question around --

Q Let me just ask you: Am I not right --

A Where did that muck come from?

Q -- the Corps of Engineers --

A And where did that muck in the upper part of the Harbor come from.

Q My question to you is the fact that the Corps of Engineers dredged in the entrance to the Harbor does not necessarily mean there is a net flow of sediment into the upper reaches of the Harbor, does it?

MR. PATTI: If you can answer the question, answer to the best of your ability. That's all we want.

BY THE WITNESS:

A I can't say categorically for sure, but you can only look at the evidence and things as presented and what you read and come up with a logical, what you believe to be a logical conclusion.

BY MR. SCHINK:

Q You in your report allowed the fact that there is calculated by EPA's other experts, a net movement of

PCBs out of the Harbor currently, isn't that right, on the order of about 20 pounds a year?

A Okay. The PCB exchange, I believe, would be a net flow out from the Harbor into the Lake.

Q That is in fact why you want to dredge the Harbor, isn't it, to prevent that from happening in the future?

A Major consideration.

Q And that the concern is that currently these materials are getting from the Harbor out into the Lake, is that right?

A My concern is --

Q Wait. Am I not right that the materials are currently getting from the Harbor into the Lake?

A That is a concern.

Q And if they are currently getting from the Harbor into the Lake, doesn't that indicate to you there is a net flow out into the Lake?

A Of PCBs?

Q And PCBs flow out because they adhere to those sediments that move out, is that right?

A Right, yes, but you can also have sediments coming in that are uncontaminated, so you have sediments coming in that are uncontaminated to replace sediments

that go out to be contaminated.

Q Do you know if that occurs?

A Hmm?

Q Do you know if that occurs?

A Why else would the U.S. Army Corps of Engineers come in and dredge if there weren't materials coming in?

Q I didn't ask you that. I asked you do you know whether the net flow in is greater than the net flow out.

A I believe the net flow in is greater than the net flow out, but I can't lay my hand on the fact to prove that is the case.

Q If the net flow in is greater than the net flow out --

A I am sorry, did I answer you correctly? You said, you twisted it around.

Q Did you answer it correctly, I don't know.

MR. PATTI: I think you reversed it.

BY MR. SCHINK:

Q If the net flow out of the sedimentation is greater than the net flow in, would that change your conclusion about whether the dredging is justified for navigational reasons?

MR. PATTI: The net flow of what out?

MR. SCHINK: I said of sediments.

MR. PATTI: Contaminated or uncontaminated, because he made a distinction.

MR. SCHINK: Sediment. Let me restate the question.

BY MR. SCHINK:

Q Your conclusion that the Harbor should be dredged is based in large measure at this point on a navigational justification, is that correct?

A This is one of our arguments.

Q That is your major argument.

A It is a major argument that we can identify. Now, there are other arguments that we can identify. Somebody may have --

Q Just a minute. We are talking about justification at Mason & Hanger.

A That we can put our finger on.

Q That is a navigational justification, correct?

A Yes, right. We are concerned that somebody can go in and disturb that sediment, some way or another. Dredging is one way that it can be disturbed. There are other ways that people can disturb that sediment.

Q Indeed, dredging is going to --

A Dredging is going to --

Q -- dredging is going to disturb that sediment further than anything you have identified, isn't it? Isn't that correct?

A Yes.

Q Isn't dredging going to disturb the sediment more than dropping an anchor?

A Correct.

Q Isn't dredging going to disturb the sediment more than a boat sinking in the Harbor?

A Yes.

Q Isn't dredging going to disturb the sediment more than a storm occurrence?

MR. PATTI: You are talking about the maintenance dredging, is that the line of inquiry here?

MR. SCHINK: No, the dredging that he has recommended.

THE WITNESS: Yes.

BY MR. SCHINK:

Q Am I correct that the dredging that you have recommended is going to disturb the sediment more than any activity that you can conceive of?

A I can't answer that question because I don't know.

Q Can you give me an example of an activity that

would disturb the sediment more than dredging that you propose?

A You have a lot of people that use that Harbor and I cannot predict what those actions of people would be in the future. There is a lot, I don't have a crystal ball.

What we propose to do is to take, remove the most contaminated of material. We can't remove every bit of PCBs and put them in a place --

Q My question is can you give me an example of an activity or an occurrence that would result in a greater disturbance of the sediment than dredging that you proposed?

A I don't -- the answer is I don't have a crystal ball that I can predict all the types of human happenings that can happen on the Harbor. I cannot predict. Somebody may come in or Larsen may come in and want to enlarge that channel or may want to do some dredging. They may want to get deeper boats and it can happen 20 years from now, it can happen 50 years from now.

I cannot predict that.

Q But as you sit here, you can't give me an example of any kind of activity in the Harbor that would

cause a greater disturbance of these sediments than the dredging that you propose. Isn't that right?

MR. PATTI: He has answered the question. I am going to object.

BY MR. SCHINK:

Q Answer the question.

MR. PATTI: If you can.

BY THE WITNESS:

A I can't answer either one side of the fence or the other side of the fence.

BY MR. SCHINK:

Q You do know that the dredging that you propose will cause the sediments to be disturbed and agitated.

A They will be disturbed and we have taken steps to minimize the spread and try to assess what that will be. Now if somebody comes in at a later date and does some dredging or some disturbing, I cannot answer that. They may not follow these procedures. They may do something a lot worse than spread.

There may be somebody that falls in and sinks to the bottom of the muck. There may be all sorts of things.

Q Has that ever occurred in the Waukegan Harbor, to your knowledge?

A I don't know. I am just --

Q Did you look into that?

A Pardon?

Q Did you look into that, whether someone had fallen into the muck?

A It is a potential hazard.

Q Did you look into whether it had occurred?

A Not specifically.

Q Did you look into the question of whether dredging techniques might not be developed within the next ten years that would enable you to, ten years from now to perform this dredging at a lower cost and with an even reduced risk of the possibility of release of PCBs to the environment?

MR. PATTI: Can you tell me what the relevance of that line of inquiry is?

MR. SCHINK: Absolutely. The question is do you do something now that is going to wreck the Harbor or do you postpone doing it, Mr. Patti. It is a remedy issue.

BY THE WITNESS:

A We didn't make the decision whether to postpone it or not, but we were given guidelines or we decided on guidelines of what we could do with the

technology that existed today.

Now, maybe sometime in the future somebody might come up with some technology to contain or otherwise do something that would be safer than what is proposed now.

BY MR. SCHINK:

Q You have been involved in chemical engineering for several years in the environmental area among others, haven't you?

A Yes.

Q And you have seen tremendous technological advances over the last two decades, haven't you, in terms of techniques for control and removal of the contaminants?

A There has been some improvement, yes.

Q There has been major improvement, hasn't there?

A Yes.

Q For example, in the technology of PCB removal 20 years ago, was the technology available to remove PCBs down to one part per billion level as you testified is possible here?

A The carbon filtration and the sand filtration existed 20 years ago, but I am not aware of any study where somebody used it for PCB removal, but the basic

equipment --

Q There have been major advances.

A There have been improvements.

Q And they have been significant. In the last 20 years --

A Well, significant is an interpretation.

Q You know what it means, don't you?

A I would say there have been significant.

Q And you cannot as you sit here today tell me there won't be significant improvements in dredging technique and technology?

MR. PATTI: This is pure speculation. For heaven's sake, Mr. Schink --

MR. SCHINK: It is not. This man is an expert on the development of technology. Obviously he is an expert --

MR. PATTI: Okay. I will stipulate that the sun can go down tomorrow.

THE WITNESS: I don't have a crystal ball that is able to say what is going to happen in the future. I have no opposition if somebody wants to wait, if you wait hoping that some technology would be developed in the future to do this more cheaply and more safely. There is also a risk that there may be some accident

that can take place or happening that can spread PCBs while it is still up in the Harbor.

BY MR. SCHINK:

Q There is that possibility --

A A lot of things can happen.

Q -- but we do know if you go ahead with the dredging that you have recommended there will be releases that would not otherwise occur to the atmosphere, is that correct?

A I think we are getting into areas that are a little outside my expertise. We were not charged to do an environmental impact statement or environmental assessment statement and practically all of these questions that you have asked are relevant to generating an environmental impact or environmental assessment statement.

Q Wouldn't you agree that there are questions that have to be answered before a particular remedy is undertaken?

A Yes.

Q And that these are questions that have to be answered before that assessment can be completed, isn't that right?

A Yes.

Q That would include among other things, quantifying the volatilization that will occur, both as a result of excavation and the dredging in the Harbor, is that right?

A That's why EPA has many consultants and we are just one of them.

Q So the recommendation that you made to EPA regarding dredging and excavation was essentially a recommendation as to if they were going to do that as opposed to whether they should do it, isn't that right?

A Um-hmm.

Q Is that fair, is that correct?

MR. PATTI: Do you understand the question?

BY THE WITNESS:

A Yes.

BY MR. SCHINK:

Q And the answer is that Mason & Hanger's engagement or undertaking in this case was to look at --

A We have --

Q -- how to do it rather than whether to do it, is that right?

A We have said that this Harbor, we have predicated our action on this Harbor being used as accessible in its use by the general public and also by the people

around there and maintain its use. And we have looked at it --

Q I understand that.

Q And we have looked at it and have recommended certain actions that the best way would be to isolate these PCBs.

Now, whether there is harm to people or to the environment, the harm of PCBs as opposed to leaving it in its place as opposed to removing it, where the potential harm is, I believe --

Q You are not in a position to answer that, are you?

A That would have to be answered by other people.

Q Right. And Mason & Hanger as an organization is not in a position to answer that question, is that correct?

A As far as harm of PCBs to other people or as far as to --

Q Whether you are better off leaving the material there as opposed to disturbing it?

A There are other factors that have to be looked into and we were not ordered or asked to look at that, at those factors.

Q Do you have any plans to do any further work

regarding the development of a navigational justification for dredging?

A I don't unless asked.

Q To your knowledge, has Mason & Hanger been asked by U.S. EPA to try to develop a factual basis for a navigational justification?

A We haven't been asked by the EPA to do that, to our knowledge.

Q As I understand it, nobody other than you is looking into that area at this point?

A Not at Mason & Hanger.

Q Do you know if anybody is looking into that area?

A Not that I am aware of.

Q Have you been asked to provide anybody with any information about navigational justification?

A No.

Q You do not feel that you made or that Mason & Hanger has made an adequate study of that issue, am I correct?

A I can't categorically say whether somebody is going to go in there and --

Q No, my question is the work that Mason & Hanger has done from the beginning of this project to today has

not been in your view sufficient to support a navigational justification, has it?

MR. PATTI: Ask him a question that doesn't assume an answer, if you would, please.

BY MR. SCHINK:

Q Can you answer the question, please?

A You are asking the same question over and over again from different points of view and I would have to go back and say we have looked, and I know this is going to irritate you, but we have looked at the data that was available to us, saw that the Army Corps of Engineers does dredge.

We believe that there is a net flow of material, not talking about PCBs, talking about sediments into the Harbor and they may cap some of the PCBs, they may do all sorts of things, into the Harbor. That is logic enough for me to suggest that sometime in the future, can't say when that will be, that somebody will want to come in and dredge. To me, it is common sense.

We have said or we are basing our assumption that we want to maintain or don't want to change the use of this Harbor. We want to continue to use the Harbor.

Now, if you don't want to continue to use

that Harbor and Larsen Marine doesn't object and they don't want to do any dredging in the future and allow the thing to silt up or do whatever it is going to do and don't worry about storms and a lot of what-ifs, I can't project on a crystal ball. Then your line of reasoning would be correct. There's a lot of ifs there.

Q Today, based on the information available to you, is there any need to dredge Waukegan Harbor for navigational purposes?

A Right now today?

Q Today.

A I don't know of any, but I can't predict in the future.

Q Today, you don't know of any need to dredge for navigational purposes, correct?

A I don't know of any need today. If there is a need, it hasn't been told to me.

Q So based on the information told to you today --

A I can't predict what the future will be.

Q I understand that. We are talking about right now as you sit here today, 1982. You are not aware of any need or any navigational justification for dredging Waukegan Harbor, is that correct?

A Not today.

Q Given that, is there any reason in your view today to engage in the dredging project in the Harbor that you have proposed in your reports?

A I can't answer that question because there are a lot of other factors that have to be brought into the situation.

Q But at the minimum, you don't recommend doing that dredging based on the situation as it exists today, is that correct?

A Not for navigational purposes, but I can't predict what will happen in the future.

Q I understand that, but we are talking about today, right now as we sit here.

A I don't see any need to dredge today.

MR. SCHINK: Thank you. I have nothing further.

MS. OLIVER: I have nothing further.

THE WITNESS: For navigational purposes --

MR. PATTI: That's it.

THE WITNESS: I am not talking --

MR. PATTI: He will ask a question.

Ms. Oliver?

MS. OLIVER: I don't have any questions.

MR. PATTI: Nothing for me.

MR. SCHINK: Thank you, Dr. Nordin. It's been

fun.

THE WITNESS: Oh, I've enjoyed it.

(Witness excused.)

FURTHER DEPONENT SAYETH NOT. . .

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,	)	
	)	
Plaintiff,	)	
	)	
vs.	)	No. 78 C 1004
	)	
OUTBOARD MARINE CORPORATION and MONSANTO COMPANY,	)	
	)	
Defendants.	)	

I hereby certify that I have read the foregoing transcript of my deposition given at the time and place aforesaid, consisting of Pages 1 to 197, inclusive, and I do again subscribe and make oath that the same is a true, correct and complete transcript of my deposition so given as aforesaid, as it now appears.

_____
John Nordin

Subscribed and sworn to
before me this ____ day
of _____, A.D. 1982.

_____
Notary Public.

UNITED STATES OF AMERICA)
NORTHERN DISTRICT OF ILLINOIS)
EASTERN DIVISION) SS:
STATE OF ILLINOIS)
COUNTY OF COOK)

I, Thea L. Urban, a notary public in and for the County of Cook and State of Illinois, do hereby certify that JOHN NORDIN was by me first duly sworn to testify the whole truth and that the above deposition was recorded stenographically by me and was reduced to typewriting under my personal direction, and that the said deposition constitutes a true record of the testimony given by said witness.

I further certify that the reading and signing of said deposition was not waived by the witness and his counsel.

I further certify that I am not a relative or employee or attorney or counsel of any of the parties, or a relative or employee of such attorney or counsel, or financially interested directly or indirectly in this action.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal of office at Chicago, Illinois, this _____ day of June, A.D. 1982.

_____
Notary Public, Cook County, Illinois.
My commission expires May 31, 1983.